

OUTLINES OF
MEDICAL JURISPRUDENCE

*WITH SPECIAL TREATMENT OF
TOXICOLOGY & INSANITY*

BY RAMES CHANDRA RAY, L.M.S.,
*Lecturer on Forensic Medicine, College of Physicians and
Surgeons of Bengal, Calcutta.*

THIRD EDITION.



CALCUTTA :
PUBLISHED BY PROPRIETOR OF
THE HARE PHARMACY,
38, AMHERST STREET.

1916

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PRINTER, G. C. NEOGI.

NABABIBHAKAR PRESS.

91/2, Machua Bazar Street, Calcutta.

First Ed., Aug. 1910, Pp. 244 and v, @ Rs. 2/-

Second Ed., Sept. 1912, Pp. 453 and vi, @ Rs. 4/-

Third Ed., March 1916, Pp. 494 and xxii, @ Rs. 4/-

One thousand copies each edition.

To be had of—

N. C. DUTTA, 32, COLLEGE STREET, CALCUTTA.

DAS GUPTA & Co., 54-3, COLLEGE STREET, CALCUTTA.

And of all respectable book-sellers.

18273

PREFACE.

This short Text-book on Medical Jurisprudence has been compiled with these ends in view, *viz.*,

firstly, to present a lucid and analytical precis of this hydra-headed subject, so as to almost graphically show the relation of one part of it to another and thereby render the subject plain and easy of comprehension ; for this purpose, I have used several kinds of types as indicators ;

secondly, to produce a suggestive and handy work that will be, at the same time, complete and up to date ; and

thirdly, to treat this practical subject in a practical manner and to render it readily available in every day life as well as in emergencies—to the STUDENT, for intelligently following his daily class-lectures, as well as for passing his examination successfully ; to the MEDICAL PRACTITIONER for effectively treating poisoning and other emergency cases ; to the LAWYER IN CRIMINAL COURT as a ready, up to date and rapid reference on this subject ; and to the POLICE OFFICER for tracking the criminal.

For obvious reasons, I have separately grouped MEDICO-LEGAL FACTS under the different heads in a way that facilitates quick reference ; and treated the chapter on POISONING and INSANITY more fully, as I find that these are the most puzzling, because the most discursive, chapters in books written ordinarily for students and practitioners. A mass of useful tables has, for similar reasons, been helpfully tabulated in the APPENDIX.

Save for a few laws and regulations in vogue over local areas, the science of Medical Jurisprudence is of cosmopolitan-interest and world-wide application ; I have taken pains, therefore, to illustrate specifically the laws and customs in vogue in the United Kingdom and in her greatest diadem, the Indian Empire in the far East—with a view to indicating the difference between medico-legal matters obtaining in the two hemispheres, in both of which this humble work may find currency.

CALCUTTA :
38, Amherst Street.
The 29th March, 1916. }

R. C. RAY.

TO THE SACRED MEMORY
OF MY DEAR FATHER,
KRISHNA CHANDRA RAY,
A BORN TEACHER AND AUTHOR,
WHO REALIZED A LIFE OF
PLAIN LIVING & HIGH THINKING
AND WHOSE DAILY SAINTLY LIFE
IDEALIZED THE FATHER TO HIS SONS,
THIS HUMBLE MAIDEN EFFORT IS
MOST REVERENTLY DEDICATED
BY HIS SON, THE AUTHOR.

NOTE FOR MEDICAL STUDENTS.

As this book contains everything that a student wants to know or is likely to require in practice, those who read it for easier or school examinations may *omit* (1) such portions as are not included in their syllabus, (2) those portions in the text that are printed in smaller types and (3) portions enclosed within brackets.

By the help of the Index, as well as the headings of medico-legal paragraphs, students can frame questions and get suggestions for answers. Answers to all the University questions have been included in the body of the text.

PORTIONS SPECIALLY USEFUL FOR POLICE OFFICERS.

(Besides all medico-legal points) :—

Pages 1-12, 16-19, 32-40, 46-47, 49, 52, 55-58, 64-65, 103, 371-373, 382-384, 410-411, 464-467, 478, 480-482, 485-488.

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OUTLINES OF MEDICAL JURISPRUDENCE.

CHAPTER I.

LEGAL MATTERS.

Definition.—**Medical Jurisprudence** (*jurista* = law), **Legal, Judicial or Forensic** (*forum* = market place) **Medicine** is that department of medical science which has relation to evidence and judicial procedure. [**Political or State Medicine** implied both medical jurisprudence and hygiene ; but now-a-days, it applies to hygiene only.]

Scope.—Study of medical jurisprudence enables a medical man—

- (1) To follow correctly the written and unwritten ethical, civil and criminal laws that relate to him in the daily practice of his profession, among *patients generally* ;
- (2) To perform adequately the duties that he owes to *men in captivity* or to *men of unsound mind* ;
- (3) To understand and trace, in the interests of *society at large*, the vicious practices that its wicked members may resort to,—thus to prevent as far as possible, the infraction of laws by such persons and evasion of justice by them ;
- (4) To save *innocent people* from false accusations of crime ;
- (5) To take proper perspective of the various *accidents and injuries* that may happen to men and to concert means for meeting them.

Difficulties in Medico-legal work in India :—(1)

False evidence and confessions—wilful or from fear, malice or cupidity—may be given alike by the police (C.P.C. § 162) and populace, rendering administration of justice difficult. (2) *Rapid decomposition*, coupled with indifference of the subordinate officers, helps to obliterate and obscure a good deal of otherwise available evidence. (3) *Rapid disposal of the corpse*—by burial or cremation or by throwing into inaccessible jungles or unfrequented wells or into running streams, where carrion-feeders destroy the corpse beyond recognition.

Crimes Peculiar to India : (1) Due to social or religious rule, superstitious fear : self immolation of a widow, burial of a leper, sacrifice of human beings to idols or of babes to the Ganges. (2) Due to penances and austerities : trial by ordeal. (3) Due to custom : 'eye for eye and tooth for tooth.'

Laws relating to Medical Practice :—

(1) Each 'qualified' (registered) practitioner is expected to put forth, to the best of his ability, a reasonable and competent degree of knowledge and skill in the exercise of his calling, and, should take every reasonable care of, and pay attention to, his charge. If, under such circumstances, a patient dies, he is not to blame. Unless it be in a public hospital, he is responsible for the acts of his assistants and nurses.

(2) Except in the cases of bona fide medical pupils, dressers, dispensers or midwives under his immediate supervision, no qualified practitioner should be associated in any case or manner with one who is not qualified.

(3) He is bound to professional secrecy, except in cases where he is required—(a) To grant medical certificates of health; (b) To notify infectious diseases; (c) To give medical evidence in court; (d) To answer references from insurance companies;

or (e) To issue *bulletins* of health. [*All such matters should be treated as private and confidential.*]

(4) He cannot **operate** on any one, or **render one unconscious**, even if it be with the sole object of saving life, without the consent of the patient, or, if he is a minor, or unconscious, or of unsound mind, that of his properly constituted guardian, or of any other person having lawful charge of him. [I. P. C. §§ 48, 89] Except under the direst need, one should not be operator and anæsthetist combined.

(5) '**Treatment**' does not extend to a *surgical operation*, without special consent ; nor may the extent of an operation sanctioned be extended, unless under very critical conditions. Hence, it is safe to obtain patient's consent to do what may become necessary in the course of an operation.

(6) He cannot induce a female to submit to sexual intercourse, under the *false pretence of treating her*.

(7) He must take scrupulous care in the custody, sale and dispensing of **poisons**.

(8) He cannot sell any **intoxicating drug** to a soldier or to a child under 12 years of age. [Act I. of 1904].

(9) If a patient, voluntarily makes a statement as to the circumstances leading up to the patient's death, it is his duty to record, in the exact words used, **the dying declaration** of the patient. [He should also similarly note any *confessions* of guilt voluntarily made by a patient who is in danger of dying]. In recording these, (a) *avoid putting questions* to the patient, except such as are required to clear up a contradiction or an obscure or ambiguous phrase ; (b) *avoid offering threats or inducements* ; (c) *read over* the statement to the person making it ; and (d) *make him sign* the document, if possible ; then seal it and send it to the magistrate at once. (e) Take minute notes about the *state of the health* of the patient and his *mental condition*. (f) Do not take any *suspected person* before the patient

making the declaration. (g) If you can do so with propriety, send for the *nearest magistrate*, instead of yourself taking down the declaration, and (h) in all cases, *secure a witness*. [I.E.A. § 32. C. P. C. § 164]. [In India, it is not necessary for the declarant to be under apprehension of death ; in England, such a declaration is inadmissible, unless the declarant is under that apprehension].

(10) **Duties to men in captivity or of unsound mind.**—These are laid down in Government Jail Codes and concern medical men in service only, who can obtain the necessary information from Government. [*Vide* Chapter on Insanity].

(11) Any instance of foul play or of infectious disease you are bound to **notify** to the nearest police or magistracy or the Health Officer, as the case may be.

(12) *Attempts to commit an offence* are punishable equally with the commission of the offence itself.

(13) *Getting intoxicated* (always detestable) is no palliation of a crime, just as ignorance of law is not.

(14) **Consent** to an act is valid when it is given by any one—(a) Who is *above twelve years* of age, where that consent is to suffer any harm which may result from any act done in good faith ; it is *18 years* in the case of acts done in good faith and not intended to cause death or grievous hurt. (I.P.C. §§ 87, 90). (b) Whose *mental faculties* are sound (*i.e.*, who is not asleep or under influence of a narcotic drug or under hypnosis or hysteria or other conditions or who is not insane). (c) Who is not under any *apprehensions* of confinement, bodily pain, injury or death. (d) Who is not under any *misconception* of fact or of the deed to be done. [*Compliance* or moral coercion is not consent.]

(15) When **examining a party medically**, obtain his or her free and voluntary consent, except in the case of male prisoners. Remember to do it—(a) in good *light*, (b) with the

aid of as many *instruments* of precision as you choose. Remember also that (c) *not even the highest judicial or executive authority has the right to order a female to be examined against her will, even though she be a notorious public woman.* (d) Do *not* yourself *strip* a patient for examination. (e) Handle the private parts gently and delicately and always maintain the dignity and honour of your sacred profession. [The consenting party should have (i) the procedure and (ii) its likely consequences to him (present and remote) according to law explained, before his or her consent is obtained ; for, no one is bound to incriminate one's self]. (f) While examining females, have some disinterested, respectable female witnesses near by.

Giving Evidence as a Witness :

In India, the preliminary '*investigation*' into a case is made by a police officer or village headman [Cr. P. C. §. 174 (1), (4)] ; thereafter, it is judicially '*inquired into* or tried' by a magistrate. During these inquiries and investigations, the medical officer is called upon to testify to injuries &c., or to hold autopsies and thereafter to give evidence in court. *All* evidence is, as a rule, *orally* given, under oath or solemn affirmation, and in the presence of the accused person and recorded by the court.

(1) If summoned to a Court of Law, go to court **well prepared**—not only with the minutest details of facts and opinions likely to be deposed to, but, also with the very language and form in which they can be best delivered. It is best to *rehearse*, in private, what one is going to say, and to get up all the most up-to-date literature on the subject, or to get oneself *coached* in it by one competent to do so.

(2) Attend court **punctually** with the subpoena that has been served on you and with any notes or other papers, books, materials &c. bearing on the subject of evidence.

(3) As an *expert* witness or as a witness in a *civil* case, you will get your **fees** ('conduct money') unless called by court itself; in such cases, demand fees and travelling allowance *before* being sworn; but you must never decline to obey a subpoena of a criminal court to give evidence or to be cross-examined (Cr. P. C. §350 Emp. *vs.* I. C. Rauth, Cal., 22-1-1900) [*Vide* Govt. of India Orders, No. 1370 dated 23-6-1869 and No. 3050 dated 11-8-1882; and Government of Bengal Order No. 3481 dated 25-6-1895]. *c.*

(4) Remember that whatever you say in the court of first instance, on that you *may be cross-examined* in any one or all the courts (Magistrate's Court, Sessions Court, High Court) through which the case may run. You have to sign your own deposition after satisfying yourself that it has been correctly recorded by the court. Your evidence may consist successively of **3 parts**—(a) *Examination-in-chief* by the counsel of your own side, who seeks to elicit the principal facts known to you, by questions which are not leading ones; (b) *Cross-examination* by adverse party in order to weaken or test your evidence; and (c) *Re-examination* by your own party, to explain seeming inaccuracies or inconsistencies.

(5) You may have to give evidence as (a) **common** witness, *to state facts*—without giving any opinion about such facts; or (b) as an **expert witness** (I. E. A. § 45) to interpret, or give your opinions on, facts, opinions or inferences placed before you,—from your own knowledge and experience, (and not the opinions you have seen some author or other persons form, on similar cases). Do not deduce such opinion from imaginary or ideal circumstances, nor dispute facts already proved at the trial. (I. E. A. § 45).

(6) **If a passage from any book is read out**, you must not signify your agreement (or otherwise) with it, without yourself reading the entire passage in its context.

(7) Do not say a word more than is necessary to answering the question asked. **If called upon to say a simple "Yes" or "No",** you must say so, but at the same time, tell the Court that such answer is likely to convey a wrong impression, if that is so.

(8) As a rule, every piece of evidence must be **orally delivered** and be *direct*, i.e., referring to facts actually seen, heard or perceived by you [I. E. A. § 60]. Hence, you are *not allowed to read out* from documents while giving evidence. As an expert witness, or with the permission of the Court, as a common witness, however, you can *refresh your memory* from (i) notes taken down by your own hand, or by others to your dictation, at the time and spot of occurrence and (ii) from professional treatises [I. E. A. §§ 159, 161]. Where an author, whose views are in evidence, can depose in court, the opinions expressed in his published books are not accepted as evidence, unless it be physically impracticable to have him in court. [I. E. A. § 60]. Every kind of evidence, oral or documentary, is liable to cross examination ; and all notes, from which memory is being refreshed, must be open to the inspection of the counsel of the opposite side, and are liable to be filed with the records of the case, unless from reasons of State, or of public safety, the court disallows it (I. E. A. § 161). [*Finger prints, Photographs and Radingraphs* (X-ray shadow photographs) provided they are taken at different planes and show the injured and sound sides and are properly explained by experts, *Chemical Examiner's report* (Cr. P. C. § 510), a *Deposition on oath* before a magistrate, specially if given by a medical witness (Cr. P. C. § 510) or by a dying person, an attested *Will* or a will taken down by the medical man at the request of a dying man, the recorded *Declaration* of a dying man as to the circumstances or cause of his death, are the **only seven kinds of writings that are accepted as evidence**, in the absence of the

person who made such statements in writing. (Cr. P. C. § 164. I. E. A. § 32).

(9) In criminal cases, if compelled by the presiding officer, you are bound to **divulge professional secrets** (which are otherwise inviolable); you can, in such cases, with the permission of the court, *write out* your answer for the perusal of the court and jury. No action for defamation can lie in respect of any evidence given in any court. No public officer who considers that disclosure of any secret would cause public interests to suffer, shall be compelled to divulge them. (I. E. A. § 124)].

(10) Remember that as you depose on oath, you may be tried for perjury if you wilfully speak an untruth. **Take nobody's side** except that of truth, regardless of the consequences to which your honest opinions may lead and never feel ashamed to say, when necessary, 'I do not know'. You should be 'unawed by fear and uninfluenced by favour or enmity.'

(11) If you cannot honestly *come to any independent conclusion of your own*, do not be prompted by vanity or fear into giving out an irresponsible opinion or acquiescing in the opinion of another, however eminent that person may be, but tell the court about your hesitations and the reasons therefor. [This also holds good about writing reports calling for decisive opinions].

(11) As an educated man, **do not lose temper** at counsel's cross-examination, nor answer as if you were personally aggrieved or insulted. *Don't argue* with counsel. *Avoid reserved or defiant manners*, and *don't indulge in feelings* about legal procedure or other matters connected with the trial.

(12) If a counsel's question does not fully elicit the truth, **supply the omission**; if there is double meaning in any question, first draw court's attention to it and then answer the

question, if you can. In no other case are you to volunteer a statement.

(14) Give your evidence slowly, distinctly, calmly and concisely, and use *non-technical* terms as far as possible and **avoid exaggerations** and unnecessary *adjectives*.

(15) Do not answer a question unless and until you have **fully understood its meaning**.

(16) *If compelled* to answer a *relevant* question, that answer cannot **incriminate you**. (1. E. A. § 132). 37 Cal. 878, 19 M. L. J. 504, 12 Bom. 440.)

Medical Reports :—In granting certificates or writing reports, state only what you *personally* know or see ; never allow a colleague's examination to take the place of your own. Write what you can substantiate yourself and enter all *doubts* as such. You may have to furnish **certificates** (often in specified form) of—

(1) Ill-health, Injuries and Assaults received by a person, —with your opinion as to the prognosis and probable causes thereof. [*Police Report*."] Such a certificate is usually confidential and no statement as to health should ordinarily find place in it. (2) A person's being a *leper* or not [Leper's Act, 1898]. (3) Fitness of an individual *for labour* in case of intended emigrants [Assam Labour Act 1901]. (4) *Age of Factory* or *Mine* hand being over 12 years. (5) Unfitness of a child for *vaccination*. (6) Freedom of an individual from *infection*, after he has been inoculated.

Medico-legally **reports** may have to be submitted of—

(1) *Death*—specifying the cause of death, the date, place, and hour as well as the identity of the person. [*Death certificates must be given for the asking even if your fees remain unpaid. But never grant certificate when in doubt about cause of death.*] (2) *Post mortem* examinations held on dead bodies. [*"Post Mortem Report."*] (3) *Mental condition* of persons as to

their sanity or otherwise. (4) *Poisons or stains* examined by request of police or magistrate [*“Chemical Examiner’s Report.”*]

Points to be specially noted :—[*Scrupulously preserve all incriminating articles brought to you or found by you, as you may be called upon to produce them in court.*] (a) All reports must be *very exact* as to name, age, sex, occupation, dates (day, month, year), hours and places of writing and of occurrence, the measurements and situations described, and expressed in *non-technical language*, devoid of exaggeration. (b) Everything recorded must be from *personal* and first-hand knowledge. (c) No *opinions*, comments or *inferences* are to be given, except separately and then as cautiously as precisely, and the grounds for such opinions (purely from the medical point of view) stated briefly. Most of these reports have to be submitted in printed special forms obtainable from Government offices. The following are the **forms** commonly required :—

(1) Questions that may be put to medical officers in court. [Bengal Government Circular No. 55 dated 1. 2. 1864 and 4. 3. 1892.] (2) Documents to be forwarded to Chemical Examiner. [B. G. Chem. Examiner’s Memo. dated 1. 4. 1901.] (3) Post Mortem Examination Form.—[Form B. C. M. D. 20 and 20a.] (4) Form for certifying Lunacy.—[B. G. Executive new form No. 80, 89, 90.]

Criminal Procedure in India.

All crimes against the body are, in the first instance, investigated into by a police officer, who sends a report to the magistrate nearest ; and, in cases of deaths, the dead bodies to the nearest government medical officer. On receiving the post mortem report, the magistrate holds the inquest and can try any person against whom the crimes can be laid. In cases of

death, in presidency towns, however, (*i.e.*, in Calcutta, Bombay and Madras), the police report to the Coroner instead.

1. **Coroner's Court Inquiry.**—In a presidency town, any case of death from accident, homicide or suicide (specially, if the same occurs in a public place) or, by means unknown, or, of a man while in custody, (except from cholera or epidemic), should be inquired into by the Coroner of the town. The Coroner can act on information received from any person and is not precluded by a death certificate from holding an inquest. The Coroner views the body of the deceased with a common jury, as, there can be no inquest without a dead body being forthcoming. He orders a medical man (the Govt. Police Surgeon in India), even the practitioner who treated the deceased, to inspect, and perform an autopsy on, the dead body and then to appear at the inquest and there to give evidence. [But there is no obligation of medical evidence.] Sitting as a court, he issues subpoenas, takes down evidence on oath, thereby holding an *inquest* or inquiry and, with the help of a jury, comes to a *finding* or *verdict* as to the 'manner' of death. There being no accused person in his court,—the proceedings resolve themselves into a simple inquiry and not a trial; hence all evidence here need not be on oath and lawyers have no *right* of examining witness, though they can do so by the courtesy of the Coroner. But all witnesses are bound to reply to questions asked.—Any suspected person can be present to be examined, who himself can cross-examine, make a statement or produce witnesses. If the Coroner sees fit, he can, after delivering verdict, issue warrant of arrest and commit the suspected person to the magisterial or to High Court for trial. Proceedings in Coroner's court are as serious as those in the High Court and witnesses should weigh each word before it is uttered.

2. **Magistrate's Court.**—In the mofassil, the inquiry is held by a magistrate, who, after recording evidence, either dis-

poses of the case or commits it to a Court of Sessions. In the case of presidency towns, a case is committed by a magistrate to the High Court.

3. **Sessions Courts**—composed of a judge and two or three *assessors* or assistants, or, in certain notified divisions, of sworn *jurors*—try and dispose of all criminal cases : only sentences of death have to be confirmed by the High Court before they can be executed.

4. **High Court.**—Criminal trials are held here with the assistance of *jurors* 'special'—in cases punishable with death—or 'common') and the High Court can try any offence authorized by law and can inflict any lawful sentence.

Every witness should remember that his depositions are bodily transferred from court to court and subjected to the severest cross-examination of counsel and to the scrutiny also of professional confreres. Medical men are exempt from serving as jurors (Cr. P. C § 320).

CHAPTER II.

(A).—MODES OF DEATH.

According to Bichat, Death, natural or unnatural, can come through only three organs—Heart (syncope), Lungs (asphyxia) or Brain (coma).

1. **Asphyxia** or **Apnœa**==death beginning in the *Lungs*, from interference with respiration. [Speaking generally, respiration stops a little before the heart. Simultaneous stoppage of both is known as *cardio-respiratory-inhibition*.]

Chief P. M. Signs [For details *vide* Chapter IV.]

1. Venous condition of blood.
2. „ distribution of blood.
3. Congestion of brain and lungs. [Tardieu's spots.]

II. Syncope—is sudden failure of the *Heart*. The *direct cause* is cerebral anæmia and the *remote causes* are 'exhaustion' of the vaso-motor centres and structural or functional derangement of the heart. Dilatation of cutaneous and intra-abdominal blood vessels, with fall of blood-pressure and cerebral anæmia are the *consequences*. [**Fainting** is a mild form of syncope. **Shock, Asthenia** or **Inhibition** is sudden temporary arrest of some functions of the nervous system, and a partial suspension of others, as the result of severe peripheral irritation, conveyed to brain by sensory or sympathetic nerve fibres. *Syncope* and **Collapse** are degrees of shock, the former being the first symptom, the latter the last, from 'inhibition' of vasomotor centres.]

Causes :

(a) *Anæmia* of brain from—

(1) Diseases of heart (valvular or myocardial); or, of blood vessels—aneurysm; arteriosclerosis. (2) Severe hæmorrhage; anæmia, chlorosis. (3) Severe organic brain or renal lesions. (4) Sudden withdrawal of large amount of fluid from body (by paracentesis, catheterization &c.). Also in pneumothorax. (5) Altered condition of blood, from circulation of poisons therein (diphtheria; digitalis or prussic acid.)

(b) *Asthenia* or weakness of heart from—

(1) Starvation (prolonged). (2) Exhausting disease or suppuration. (3) Concussion of spine. (4) Sudden blow on epigastrium, or cardiac area or larynx or nose or head. (5) Direct injury to heart, or its fatty degeneration. (6) Sudden strong emotions (fright, grief, joy, pain &c.)

Symptoms (of comparative failure of heart)—

1. Cold sweat on brow, hands &c.
2. Pallor, Faintness.
3. Restlessness. Air-hunger.
4. Vomiting or nausea.

5. Paralysis of sphincters.
6. *Respiration*—gasping.
7. *Pulse*—slow in anæmia or quick in asthenia.
8. Subjective sensations of colour and sound.

Post Mortem Signs [Nothing characteristic].

1. *Heart* :—In asthenia, flabby and full or empty ; in anæmia, contracted and empty.
2. *Arterial* circulation—is comparatively empty.
3. *Brain* and *Lungs*—not congested.
4. *Face* and perhaps organs—blanched.

III. **Coma** :—profound, prolonged insensibility, producing death by asphyxia. Death *begins* in the *head* or brain, but comes *finally* through the *lungs*.

Causes :

(1) Increased *intracranial pressure*, from injuries to, or inflammatory states of, brain. (2) Interference with *circulation* or *functions* of brain : heat-stroke, cerebral embolism or thrombosis. (3) Narcotic *poisons*—opium, barium, arsenic etc., Cholæmia, uræmia etc.

Symptoms :—(All signs of vitality, excepting those of organic life are suppressed).

1. *Insensibility*, from which one cannot be roused
2. *Reflexes* lost.
3. *Pupils* dilated.
4. *Breathing* slow, stertorous, irregular ; cheeks puff up.
5. *Pulse*—slow, laboured.

P. M. Signs [Those of asphyxia, which is the cause of death ultimately] :—

1. Brain and its membranes and lungs—are congested. [Serous exudation inside brain, if death is from apoplexy]
2. Venous distribution of blood : right heart, full.

(B.) CAUSES OF SUDDEN DEATH.

I. Those due to diseases or conditions that are generally acknowledged to terminate in sudden death :—

1. Endocarditis. Valvular Heart Disease—especially Aortic Regurgitation. 2. Angina Pectoris.
3. Fatty or Fibroid Heart. 4. Rupture of Heart.
5. Tumours on Heart-wall. Myocarditis. 6. Pericarditis.
7. Aneurysm—Aortic, Pulmonary, Intrapericardial, Basilar (or of other cerebral vessels).
8. Aortic Rupture. Atheroma. 9. Embolism, Thrombosis.
10. Apoplexy—Cerebral, Pulmonary, Ovarian.
11. Acute Œdema of glottis. 12. Laryngismus Stridulus.
13. Emphysema, Whooping cough, Asthma, Pleuritic effusion (excessive). 14. Acute Œdema of lungs.
15. Pneumo-, Hydro- or Hæmo-thorax.
16. Chronic Alcoholism. 17. Foreign bodies in throat.
18. Rupture of visceral ulcers or abscesses. 19. Epilepsy.
20. Rupture of Viscera—Spleen, Uterus, Gall Bladder, Urinary Bladder. 21. Pelvic Hæmatocele.
22. Addison's Disease. 23. Poisons like HCN &c.

II. Those due to diseases or conditions that do not usually terminate in sudden death :—

1. Cholera. 2. Acute Rheumatism, Gout.
3. Bright's disease. 4. Diabetes.
5. Diphtheria. 6. Enlarged Thyroid.
7. Excessive Tobacco habit. 8. Syringomyelia.
9. Chronic middle-ear disease. 10. Atlanto-axoid disease.
11. Chronic purulent meningitis. 12. Chronic cholelithiasis.
13. Abscess and tumours of brain.
14. Pneumonia, phthisis, pleurisy.
15. Influenza. 16. Sudden rupture of big cyst.
17. Volvulus and acute intestinal obstruction.

18. Vomiting, with drawing in of food into larynx (by children or drunkards or those unconscious).

III. Cases of no appreciable injury or disease :

1. Extreme sudden emotion or terror. 2. Lymphatism.
2. Intra-uterine injection or even simple vaginal injection or passage of a catheter into an overdistended bladder.
3. Severe pressure on testicles.
4. Blows on stomach, abdomen, larynx, head, nose etc.
5. Sudden ingestion of a large amount of alcohol or cold water when one is heated.
6. Sudden irritation of larynx.

(C) SIGNS OF DEATH.

[Death is (1) **Somatic, Systemic or General**—total extinction of the actions of heart and lungs. (2) **Molecular, Local or Cellular** death—of tissues.]

Suspended animation.—Rare cases, resembling the hybernation of toads, have occurred. Such cases do not manifest any action of heart or lungs, become cold and stiff and fail to respond to ordinary stimuli. After varying periods, they have come back to life. [e. g., cases of Col. Townshend and Haridas Sadhu, 1847]. Infants have for hours lived a passive existence, whose lungs never breathed. It may be associated also with—catalepsy, cholera, chloroform poisoning, collapse after child-birth, concussion, dentition in infants, drowning, rare cases of fever, hanging, lethargic stupor, some nervous diseases, still-birth, sun-stroke, tetanus, &c.

From a totality of these signs, and not from any one of them individually, death can be pronounced :—

I. Cessation of Circulation, entirely and continuously.

Proofs :—

1. *Pulse* not felt ; *heart-beats* not heard for 5 minutes continuously. [Notes (a) Life is not incompatible with a temporary suspension of heart-beat, but six seconds is the

longest interval recorded between any two beats of the heart (Rayer). (b) Even in the worst cases of *syncope*, the heart fails to work at its usual pitch, but its action is never suspended (Bouchut). (c) In doubtful cases, repeated, accurate auscultations of the heart-sounds seldom fail to decide real from apparent death. (d) Pulse may be quite imperceptible for some days before actual death takes place.

2. A *finger*, if tightly *ligatured*, does not *swell* on its *distal* end (Magnus's Test). 3. A *divided artery* does not *spirt*.

4. Burn does not raise a *blister* with *serum* within and an *inflamed* base.

II. Cessation of Respiration—completely, continuously, for over $3\frac{1}{2}$ minutes.

Proofs :—

1. *Cotton-fibre* or feather held before the nostrils is not blown.
2. *Cold mirror* or *glazed* metallic surface held before the nostrils is not hazed.
3. A *saucerful of water* or of mercury, if placed over the chest, is not rippled or spilled. (Winslow's Test.)
4. *Auscultation over larynx* fails to reveal breath-sounds.

[**Caution :—**New-born *babes*, men in *trance* or other conditions of *suspended animation*, have been known to live long without responding to tests of respiration.]

III. Unconsciousness.—No response to painful stimuli.

IV Loss of Sensibility and Motion of every part of the body :—Note that—in those drowned, in prolonged fainting, epileptic, apoplectic or cataleptic fits, profound sleep, or in *trance*, though there may be loss of sensibility and of motion, heart and respiration have been known to go on, though extremely feebly. Premature burials have resulted, because such persons totally lost sensibility and motion.

V. Skin becomes (a) *Pale* and *waxy-looking*—from failure of circulation ; hence, heat applied to it, raises a blister with gas inside. (b) *Livid*—from hypostasis. (c) *Opaque* to transmitted light and (d) *In-elastic* :—hence, left on a flat surface, skin does not regain its shape. [Caution :—Loss of elasticity is the only reliable cutaneous sign of death. Bodies of persons dead from phosphorus poisoning or jaundice remain yellow ; tattoo marks, edges of ulcers, ante-mortem bruises, wounds and extravasations retain their colour]

VI. Eye changes :—(a) *Flaccidity* of eyeballs, (b) their *shrinkage* (from transudation of aqueous humour), (c) *opacity* of cornea, and (d) loss of *corneal reflex*. [Cautions :—(a) All these may also be found in *life*, under certain conditions. (b) From the *size of the pupils* at death, no inference can be drawn about their size, immediately preceding death. (c) Though, after death, the pupils do not re-act to light, they are acted on by *atropine* or *eserine* for about an hour after death. (d) In death from CO_2 , HCN , apoplexy etc., the *eyes remain brilliant even after death*].

VII. General Muscular Relaxation.—Hence, *jaws* drop, *eyes* keep half-open, *limbs* are flaccid, *joints* are flexible. [After death, the muscles pass through three Stages : (a) **Relaxation** (primary)—*while body is cooling* :—During this, muscles are *contractile* to stimuli. All muscles are not irritable for the same length of time, nor do they all loose at once the susceptibility to contraction. In deaths from cholera or from non-exhausting diseases, this irritability lasts longer. In cadaveric 'spasm', this is absent. *The presence of this irritability in a voluntary muscle proves that the person was living, or, was in the first stage following death.* (b) **Rigidity** or rigor mortis proper,—during which the muscles are dead and are no longer contractile, and the body has cooled down. (c) **Relaxa-**

tion (secondary)—*running on to putrefaction*, during which muscle is not contractile].

VIII. Rigor Mortis :—This occurs *after* the body has cooled down, when the muscles have lost local life.

Cause : Coagulation of muscle-plasma and formation of myosin, or muscle-fibrin. Hence, a limb in rigor mortis easily loses it, if the muscles are torn or cut across. Onset of it does not change the position of the muscles at death. [Rare cases of **quick contraction** of muscles have, however, been known to occur after death from cholera, lightning-stroke, plague, yellow fever &c. ; hence, probably, corpses have turned in their graves.] It ordinarily takes place at 113°F and at a lower temperature in tired muscles. This coagulation is independent of nerve action. In hot bodies (say 75°C), such as those found in burnt buildings, the rigidity is much increased.

Period of onset : Starting *before* the body is cool, it is *not manifest* until the body is cold. [It may, in rare cases, set in even before heart stops.]

Condition of Muscles in R.M.—They are *opaque*, *inelastic*, (not regaining position if forcibly stretched), *acid* in reaction. [(a) A *naturally contracted*, *living* muscle is translucent, elastic, neutral or alkaline and may contain, at most, the precursors of myosin. (b) A *limb in cataleptic state*, if forcibly bent, *does resume* its position.]

Order of onset : [It occurs in *involuntary* muscles and in the *heart* earlier than it occurs in voluntary muscles.] :—Eyelids, neck, lower jaw, face, trunk (back), upper limbs and lastly lower limbs ; it proceeds from above downwards and appears later and lasts longer in the lower limbs. [During **R. M. of heart**, which comes on within an hour of death, so strongly does the left ventricle contract, that it looks smaller than normal and after about 10-12 hours (when R.M. of heart is passing off) the ven-

tricular walls become so flabby as to appear dilated. The left side usually contracts more strongly than the right side : hence, *condition of heart at autopsy may not afford certain proof of its condition at death.*]

Order of disappearance : According to Larcher, the muscles which are the first to become rigid are the longest to retain rigidity. According to Dixon Mann, the muscles which first become rigid are the first to lose rigidity.

Duration.—(a) When it sets in *early*, the less prominent is the hardness and the shorter is the duration ; the *later* the onset, the more pronounced is the hardness and the longer is the duration. (b) In the *new-born*, it occurs early and is evanescent and it does not occur in the foetus before 7th month. (c) It *lasts long* in cold countries and in deaths from poisoning by irritants, CO₂ &c., as well as in bodies immersed in cold water. Long persistence of it is co-existent with putrefactive changes. Hence, onset is—

Hastened by

1. Fatiguing exertions before death (convulsion, lightning stroke, veratrine or strychnine poisoning etc.)
2. *Slow lingering* or *exhausting* disease,—phthisis, or typhoid fever, cholera or opium poisoning. Emaciation.
3. *Heat and moisture* in moderation, as in warm weather.
4. *Adult* life.
5. If *nerves* are *not* in tact.

Retarded by

1. *Asphyxial* death, specially death from hanging or carbonic gas poisoning.
2. *Sudden* or *violent* death in vigorous health, *unattended by convulsion* (bleeding, decapitation, apoplexy, irritant poison.)
3. Moderate *dry, cold* weather. *Poisons* having antiseptic action (As, Hg)
4. *Extremes of life.*
5. If *nerves* are in tact.

Theories accounting for its disappearance :—(1) Excessive *acid* develops in the act and this *dissolves* the coagulated myosin, which keeps up the rigidity. (2) Decomposition of body produces *ammonia* ; this alkali *dissolves* the myosin. (3) *Microbes* soften the myosin. [Microbes act best in warmth, moisture and oxygen ; ∴, *R. M. passes off rapidly in deaths from septic diseases or in deaths from lightning*].

• ‘**Instantaneous**’ *R. M.* or **Cadaveric “Spasm”**—is *spasm* of muscles at death (the last actions of life being crystallized in their exact attitudes) which rapidly passes into true rigor mortis [The initial post mortem relaxation of muscles is *absent* in these cases]

CIRCUMSTANCES CAUSING CADAVERIC “SPASM” are : (1) *sudden death*, (2) *death due to violence to the central nervous system*, (3) *sudden asphyxia*, or drowning or death from cold, (4) *strong muscularity* of the dying individual, (5) when death has been *preceded by severe muscular exertion* ; hence, *we find it in—violent deaths*, in soldiers killed on the field, (specially with wounds of chest, head or neck), in suicides, in acute suffocation, (hanging, drowning, poisoning by certain gases) and in electrocution, (unless dextrously prevented by electrical contrivances.) *It cannot be imitated artificially after death, and its presence in a dead body is a proof that the object gripped by it was thus gripped by it at the moment of death* [Emp. v. *Suddhabodh Bhattacharji*, Cal., 1888] [In rare instances, it may occur in *peaceful, natural death* ; per contra, in spite of presence of the causative circumstances, detailed above, cadaveric spasm may not occur. Hence, if a cutting instrument be held loosely by the hand of the deceased, or, if it has dropped from the lightly closed hand, that fact per se does not belie suicide nor is an evidence in itself of murder].

IX. Cooling of the Body.—This is one of the *surest signs* of death and one of the safest means of ascertaining *time*

of death. [*Invariably*, use the thermometer, *in the rectum*. Also note temperature of room and condition of weather.] At death, face becomes cold before the skin of chest and abdomen, and the whole body tends to assume the temperature of its surroundings.

The time in which it does so, varies with—1. Condition of body as regards *adiposity*. 2. Diseases causing death (*microbic, pyrexial &c.*) 3. The *modes of death* (some retard heat-loss.) 4. *Age* and *vigour* at time of death. 5. Nature of the *medium* in which the corpse is. Hence, cooling is—

HASTENED BY

1. Leanness of body. Wasting diseases.
2. Non-microbic or chronic non-pyrexial diseases.
3. Lingered death.
4. Extremes of age.
5. (a) Want of covering (b) Cool temperature (c) Open place. (d) Marble or other cold floorings. (e) Free access of air. (f) Immersion in running water.

RETARDED BY

1. Obesity of body.
2. Sudden death ; strychnine poisoning. Acute fevers, Microbic diseases.
3. Death from cholera, apoplexy, asphyxia.
4. Vigorous state of health.
5. (a) Covered body (b) Hot medium (c) Small closed space (d) Hot floors. (e) Want of play of air. (f) Still water.

The rate of heat-loss is in proportion to the difference in temperature between the corpse and the medium in which it is placed,—about 4°—5° F. in the earlier and 1° F. per hour during the later periods. Death from hæmorrhage little affects the cooling process.

P. M. Rise of Temperature may occur in deaths from—

1. Tetanus. Asphyxia.
2. Strychnine Poisoning.
3. Apoplexy.
4. Cholera.

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| 5. Abscess of Liver. | 6. Peritonitis. |
| 7. Acute Rheumatism. | 8. Acute Bright's disease. |
| 9. Yellow fever. | 10. Small Pox. |
| 11. Cerebro-spinal meningitis. | 12. Injuries to the nervous system. |

X. Coagulation of Blood.—In the dead, blood clots (=dies) after the body begins to cool (at least 4 hours after death). It coagulates in layers—the top portion looking like colourless jelly, the bottom portion, deep blue or black. [After death, (a) while body is warm, blood is *fluid* and lies mostly in veins. (b) When body cools, it *coagulates*; (c) thereafter, when decomposition sets in, blood becomes *liquid again* and disintegrated *i.e.*, it cannot again clot, but can only dry up. Hence, “if, instead of a red, homogeneous, coagulable liquid, we obtain a reddish-coloured serum, from which the particles readily subside as a red sediment, we shall be justified in inferring that life has ceased”. *In the same body, fluid and coagulated blood may be found at the same time.* Usually, blood is *fluid for a long time* in all sudden and asphyxial deaths.]

Ante Mortem clot.

1. Colour : *uniformly* greyish red.
2. Consistency : *firm*.
3. *Shreddy*—can be peeled off into layers.
4. *Adherent* to vessel-wall, the surface of which is *rough*.
5. Form : *oval* or elliptical, with apex downwards.

Post Mortem clot.

1. Colour—is in 2 layers—lower coloured (R.B.C.), upper whitish (serum, W. B. C.)
2. Consistency : *soft*.
3. *Homogeneous* : cannot be peeled into layers.
4. Vessel-wall is *smooth*.
5. Form : Long, *irregular* streak or drop.

Hence, if in examining dead bodies, the colourless or whitish part of the clot is found at the undermost part,—the inference is, that the position of the body has been changed, after coagulation took place.

XI. Post Mortem Staining.

Synonyms :—Sugilation, post mortem hypostasis or stains or lividity ; Vibices.

Stages :—

Cadaveric or	} Hypostasis	Cadaveric	} Ecchymosis
Post mortem		False		or Lividity.

1. Earlier Stage = Hypostasis.

STARTS—in patches (which ultimately coalesce), only in the *dependent* parts, *before* putrefaction sets in, while the body still retains *some warmth*. It occurs as well in full-blooded bodies as in bodies dead from hæmorrhage. By changing the position of the body, or by pressing over the stained parts, while the body is *still warm*, these discolourations may be made to shift their original seats.

CAUSE : It is dependent on (a) sedimentation* of R.B.C. of stagnating *fluid*, warm blood ; and on (b) amount of *fibrin* present in blood. Hence, in acute fatal inflammation, with much fibrin, where blood clots even before death, the hypostasis will be tardy and scanty ; in phthisis, non-pyrexial, or septic or asphyxial deaths, in which fibrin is scanty in amount, the blood coagulates slowly ; hence, the hypostasis will be rapid and extensive. It *continues to increase* until the blood is coagulated, when its formation is arrested, until blood again becomes fluid, when the next stage, ecchymosis, begins.

THE COLOUR of such stains depends on that of the blood—*bright or dull red*.

THE SITES OF FIRST APPEARANCE—are the dependent parts of body.

2. Later Stage=P.M. Lividity or Ecchymosis.

CAUSE : As the *result of putrefaction*, blood becomes fluid again ; in this fluid blood, H_2S and $(NH_4)_2S$ act on the iron of blood and produce the *greenish* compound ; and blood stagnating irregularly in capillaries, produces the stains in situ.

COLOUR of such stains is from *coppery-red* to *bluish green*.

OCCURS—in *large areas*, *after* the body becomes *cold*. [After death, signs of ante-mortem active congestion gradually give place to venous fulness] It is *extensive* and *uniform*, if body rested on a *smooth* surface ; the discolorations being interrupted and *irregular* wherever irregularities of surface are present, as when a body is laid on a charpoy, giving rise to wrong suspicions of assault before death (as in case of Reg. vs. Kirk).

SITE OF FIRST APPEARANCE : abdominal wall near groin ; neck and the extremities ; in floating bodies—in temples, ears, nape of neck, face, throat, chest.

Appears early in—

1. *Full-blooded men*
2. *Long bed-ridden, slowly-dying men—appearing even before death.*

Appears late in—

1. Men having *little* blood.
2. Men having *poor* blood.

Appears even in death from severe haemorrhage. Blood coagulates in dead bodies slowly, owing to presence in it of excess of CO_2 . *As in asphyxial deaths, blood remains fluid very long, postmortem stains are better marked.* [HYPOSTASIS IS REMOVEABLE by alteration of the position of the body within 4 hours of formation of stain, provided blood has not coagulated. Not so with ecchymosis.]

ORGAN IN WHICH P.M. STAINS DO NOT OCCUR is the heart—due to the texture of the cardiac muscles and rapid onset of rigor mortis of the heart muscles.

Most of the internal organs are very vascular ; more intense p. m. lividity of these parts is \therefore apt to lead to erroneous **PRE-SUMPTIONS OF INFLAMMATION** of them. *Parts acutely inflamed* can, as a rule, be distinguished easily ; but parts suffering from diffuse or less severe inflammation are less intensely livid. If *Stomach is really inflamed*, there will be localized peritonitis or actual haemorrhage ; if not, then on stretching its wall, the engorged veins stand out as *separate* black streaks.

True (A.M.) Congestion.

1. Well-marked *turgidity* of veins generally, present.
2. Presence of sticky *serum* or *pus*.
3. Dulness of *lustre* of serous membrane.

False (P.M.) hypostasis.

2. No turgidity. Found only in dependent parts.
2. No pus or serum.
3. No such change.

True Ecchymosis.

1. Visible on inspection, *immediately* at time of death.
2. Cuticle *abraded*.
3. The bruised part is *elevated* above general level of skin.
4. Parts *injured*, are *not necessarily dependent ones*.
5. *Edges*, *not sharply* defined. Sign of *inflammation* present.
6. Colour *changes commenced*, centre being deepest.
7. No *pressure-effect* : parts pressed on are only *lighter*, never white.

False Bruise :

1. Visible *long after* death & goes on increasing in size.
2. Cuticle—*not abraded*.
3. *Not* so elevated.
4. Necessarily in most *dependent* parts of body.
5. Edges, sharply defined *till* decomposition sets in. No sign of inflammation.
6. Colour *uniformly dark* : no changes taken place.
7. *Striped* appearance from pressure—pressed parts being absolutely white.

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| <p>8. On incision, blood is found <i>outside vessels</i>. Blood is <i>coagulated</i>.</p> <p>9. Blood—<i>large</i> in amount lies <i>below</i> epidermis (in true skin or even deeper). Bruise is of <i>large</i> size.</p> | <p>8. Blood <i>not coagulated</i>. Puncta cruenta are visible. Blood is <i>inside</i> vessels.</p> <p>9. Extravasated blood (a mere <i>stain</i>) is in epidermis, or cutis, <i>above true skin</i>, & of <i>small</i> size.</p> |
|---|--|

[It is not always possible to differentiate a P. M. bruise raised while body is still warm and muscles flaccid (say upto 2 hours) from one caused ante mortem.]

XII. Putrefaction*—*is the only surest sign of death.*

Definition—The breaking up of *nitrogenous* (organic) substances into simpler elementary bodies by *bacterium termo*, with development of colour-changes and foul-smelling products. [Saprophytic and other bacteria, which produce putrefaction, probably set up a kind of ferment to continue their action. They are ordinarily abundant in intestines, skin and other tissues and in the upper foot and a half of soil. They are chiefly—*proteus vulgaris*, *p. mirabilis*, *p. zenker*, *b. cadaveris*, *b. gaudis* etc.] *It commences before rigor mortis has passed off.*

Conditions necessary to putrefaction :

1. *Warmth* : it starts at 50° F. and goes on best at 70°–100° F. [Temperature—below 32° F inhibits it ; over 100° F retards it ; above 212° F arrests it.]

2. *Moisture*.—A body weighing 150 lbs contains 100 lbs of water. Eyes, brain, inflamed parts and dropsical or wet bodies putrefy easily. [But immersion in water modifies or retards putrefaction.]

* *Gangrene* is death of a part of the living body and putrefaction is entirely a post mortem phenomenon. When putrefaction is advanced, the two are indistinguishable.

3. Free supply of *oxygen*, especially in early stages, when the aerobic micro-organisms work. An-aerobic bacteria go on without oxygen. *Air, especially if moist, warm, still and in low-lying districts, helps putrefaction, as it is full of germs.]

Hastened by :

1. Presence of *much liquids* in the body, as in deaths from acute diseases, dropsy etc ; Fat, flabby plethoric or infant bodies.
2. *Heat* in moderation—in death from convulsions, strychnine, lightning.
3. If death is due to *sepsis* or *microbic* action—dysentery, H_2S poisoning, fevers, inflammation, bruising and mangling, chronic alcoholism.
4. Presence of *warm, still, moist atmosphere*.

Retarded by :

- Death from advanced age, hæmorrhage or *emaciation*.
2. *Extremes* of temperature.
- Injecting *antiseptics* into body ; unmangled state of body before death.
4. *Embalming*, covering with lime, tight-fitting coffins, close-fitting clothes, complete submergence under water, deep burial.

Tissues that resist putrefaction long : Liver, uterus, large arteries, bones, teeth, hair [Bones 2000 years old have preserved their integrity].

The Phenomena :

(A) **Externally. :—**

I. COLOUR CHANGES. (a) *On surface of body*—greenish, or coppery-purple ecchymoses,—commence first over the site of

the caecum, and along the superficial veins, specially in neck and limbs. They are due to decomposition of red blood corpuscles whose haemoglobin is set free in the serum. (b) *In internal organs* : Liver, spleen, kidneys are tinged shades of dark-red, running on to black. Bile, soaking through gall bladder, tinges organs* in contact with it, yellow green or black.

Order of appearance (externally) : according as the body is—

Below water

In Air

- | | | |
|-----------------------------|--------------|-----------|
| 1. Face and neck or sternum | 1. Abdomen | 2. Chest. |
| 2. Shoulders | 3. Arms. | 3. Face |
| 4. Abdomen | 5. Legs. | 4. Legs. |
| | 5. Shoulders | 6. Arms. |

[Assuming that an equal average temperature obtains in all three cases, the time-ratio for putrefactive changes would be : one week in *air* equals two weeks in *water* and eight weeks' burial *under earth* in the usual manner.]

II. FORMATION OF GASES : Effects :

(1) *Evolution of bad odourous Gases* : (a) Early stage : PH_3 , CH_4 , CO_2 , NH_3 , H_2 S. (b) Later stage : CH_4 , CO_2 . (c) Last stage : CO_2 , NH_3 , N. [Ordinarily, N, CO_2 , and ordinary air are found.]

(2) *Swelling and discolouration of the body generally*, \therefore features become bloated, \therefore unrecognisable.

* *Regarding stomach*, note (1) that P. M. appearances due to putrefaction may simulate those of irritant-poisoning during life ; in latter case, ecchymoses are visible before putrefaction sets in, are not necessarily in dependent parts, and there are effusion of blood, lymph and mucus and the mucous membrane peels off readily. (2) That A. M. inflammation of stomach from irritant poisoning or other causes, will be apparent for weeks after death, if severe ; but will be lost sight of as soon as putrefaction sets in, if slight. (3) That melanosis beneath the submucous layer—is distinguished from P. M. lividity by absence of signs of inflammation, corrosion or destruction of mucous membrane.

(3) *Formation of blebs, softening and denudation* of cuticles, (displaying the white surface beneath) specially of hands and feet and of mucous membranes. *Loosening* of hair and nails.

(4) *Extrusion of rectum, uterus and eyes* and their contents :—Exudation of *frothy fluid* and contents of stomach from mouth and nostrils. Lips everted and tongue blackened and forced against teeth or protruded (simulating strangling).

(5) *Bleeding from or into injuries*,—specially if pressed over the inflamed parts, owing to R. M. squeezing the blood from arteries into veins and capillaries and putrefactive gases forcing it out. All *bruises* increase in size and in intensity of discolouration and it becomes difficult to differentiate ante mortem ones from post mortem ones.

(6) *Displacement of P.M. lividities.*

(7) *Heart* may be distended with gas or collapsed, like lungs,—from both of which, blood has been driven out. [But an empty heart (specially if also contracted) and empty lungs are per se no signs of putrefaction].

(8) Fluid, uncoagulable, foetid blood soaks into *pleural* and *pericardial* and even *peritoneal* cavities.

(9) *Bursting* of abdomen, thorax and of cranial sutures, with extrusion of their contents. Diaphragm is pushed upwards.

(10) Body *alternately floats* (when gases form) *and sinks* (when gases escape).

III. APPEARANCE OF MAGGOTS.—By a careful study of Megnin's 'Fauna of the Cadaver,' wherein the different classes of insects that are attracted to a dead body by the products formed at successive stages of putrefaction are tabulated, it is possible to estimate the period of time that has elapsed since death, if one can identify the particular kind of maggots present at the time of inspection of the corpse.

B. Internal parts of the body :—They too undergo disintegration and colour changes. The *order* and approximate *periods* (English) of onset of putrefaction are given in brackets against each organ :—

1. Laryngeal and Tracheal mucous membrane (3—5 days).
2. Brain of Infants (4—5 days).
3. Stomach (5—6 days) ; Intestines.
4. Spleen.
5. Omentum and mesentery.
6. Liver.
7. Adult Brain (1-2 weeks).
8. Neighbourhood of gangrenes, abscesses.
9. Arteries (small).
10. Heart
11. Lungs (∵ air in it is sterile).
12. Kidneys.
13. Bladder (∵ urine is aseptic).
14. Oesophagus.
15. Pancreas.
16. Diaphragm.
17. Other Blood vessels.
18. Uterus (unimpregnated)

Burial: 1. Here putrefaction occurs in a limited supply of air.

2. It is not possible to fix the period of interment from an examination of a corpse and its coffin.

3. Unless encased in metals and adipocere formation has occurred, in about 10 years, soft parts are destroyed, even if enclosed in thin wooden coffins.

4. The bodies of children, old persons and adults putrefy in the order in which they are arranged here.

5. Not unless we know accurately (a) atmospheric condition (b) the duration of burial, (c) the depth and kind of soil as to porosity, moisture, organic contamination, (d) perishable (or not) nature of coffin and manner of burial, (e) length of time it was exposed to air before burial, (f) past medical history—can we give the time of burial except as a conjecture, as, these are the various factors governing putrefaction. The diurnal variations in temperature reach down to the first 3 ft. and the monthly changes to 6 ft. of earth.

If putrefaction does not occur, the body undergoes either—

1. **Mummification**, Petrification, Dessication or Drying.—

Occurs—naturally in *hot* and *dry* climates, as in deserts or dry high altitudes. Bodies enclosed in boxes or buried in dry soil or dead of *arsenical poisoning* mummify. *Takes* at least 3 months to be 'completed.' It is never complete—the internal parts of the body (specially the intestines) do undergo putrefaction and finally, the body crumbles to pieces. *The changes are* :—Body shrinks in size, skin becomes leathery, muscles and internal organs disappear by putrefaction. Or body undergoes—

2. **Saponification**=formation first of NH_3 , and later, of Ca-soap=*Adipocere*. The body looks as if it received a coating of a white or brownish unctuous substance, looking intermediate between fat (adepts) and wax (cera). *Composition of Adipocere* (very variable)=Fatty acids + NH_3 , Ca, or other bases derived from the body. The "soap" is soluble in ether and alcohol. It burns, floats, and is acid in reaction. *Requires for its formation* :—(a) NH_3 from any substance rich in N, (as blood, fibrin of muscles and the cellular membrane supporting fat) and decomposing *fut* (i.e., a fat and flabby body); (b) *deprivation of air* : e.g.—burial in marl or clay, in loose mould or any porous soil much impregnated with animal or vegetable matter and (c) *water*, as in damp porous soil or running water. Hence, children's bodies and fatty parts of the body (bone marrow, hollow of cheeks, chin, female breasts, groins, front part of thigh) undergo this change. The whole adult body or internal organs rarely undergo this change. *Though saponified for years, the viscera can be identified in a corpse*, as adipocere is a stable body.

Table for ascertaining the hour of death (Tidy) :—

A. *Dead at the longest from 10-12 hours* :

1. Circulation and respiration have stopped completely.

2. Eyes dull, pupils fixed, loss of tension of eye globes.
3. Muscles react to stimuli and are relaxed.
4. Body is cold. 5. Extreme pallor of body generally.
6. Rigor mortis.
7. Hypostasis in dependent parts of body.

B. *Dead from 2-3 days.*

8. Blood is coagulated.
9. Rigor mortis passing or passed off.

C. *Dead more than 3 days :*

10. Signs of putrefaction.

CHAPTER III.

(A) POST MORTEM EXAMINATION.

Object.—To find out (1) *mode* (asphyxial &c.) and (2) *manner* of death (homicide, accident or suicide).

Procedure in re a Corpse in India :

I. **A Local Police investigation**—of (a) *the corpse* and (b) *its surroundings* by a police officer or magistrate. This is held, to find out (a) the identity of the corpse, (b) the manner of death and (c) the links in the chain of events leading thereto. Thereafter, the body is sent up to the mortuary for medical examination.

II. **A Medical Examination**, which is divided into—

1. **EXTERNAL EXAMINATION** of body and its coverings for finding—(a) Marks, characteristics or peculiarities—for establishing identity, age, sex, nationality and occupation of the deceased, where these are unknown ; (b) *Traces of wounds*

or injuries,—their nature, extent, age, significance and manner of causation.

2. INTERNAL EXAMINATION of viscera and orifices of the body (if necessary, microscopically too).

III. Chemical Examination of—

1. Viscera and their contents—sent up by the medical officer (coroner's or police surgeon).
2. Stains, food, drinks, tobacco, contents of phials, scrapings of earth where dejecta or poisons fell, dejecta or other articles—sent up by the police.

I. Preliminary Investigation (By Police)

[REMEMBER—*no point is trivial, nothing negligible.* (1) Take minute and copious *notes*, on the spot. (2) Make a *sketch* or take *photographs* of the scene. (3) Note *date, hour, place*, names and address of *persons accompanying* you and their behaviour and attitude. (4) Note names and address of persons *who identify* the corpse and their grounds for identification. (5) *The police should not touch any cords, hairs, grass, weeds etc., grasped by deceased, nor remove traces of mud, blood, semen &c. found on body, nor move about or take out weapons grasped or sticking out.* (6) A *private mark* should be put on every suspected article taken charge of. (7) It is best not to roughly handle the corpse during an investigation or subsequent removal and to *preserve everything found on the deceased as it was.*]

Local Inspection of the corpse – Necropsy. Note : –

1. *Attitude, location and position* of the body as a whole, of its limbs and of its clothes, in relation to nearest objects.
2. Are *hands clenched*? What is the position of hands, with reference to weapon? Is it easily grasped or tightly?

Are there any hairs in hands? If so, what are their colour, length, coatings? Are they dyed, oily, or crisp?

3. Any signs of *struggle*? Note them in detail. Condition of the hair and dress? Any peculiarities in dress or ornament? Do clothes bear rents, cuts, marks of corrosive acids, animal secretions, blood &c.? If so, their direction and position? Do those on under-garments correspond to those on outer-garments in colour, position, shape and size? Do the cut edges show stains? Are the stains on inside or outside of the garments? [A first stab may show no stain on the garments but subsequent ones may show stains].

4. Has there been any *interference with body after death*? What is the position of 'death lividity'? Which part of the room shows the greatest effusion of blood?

5. What is the condition of the *soles* of hands and feet?

6. Remove bed-sheets and measure *foot-prints*, if any, and take photos of them. Note direction of arterial spurts, if any. If there are any finger-prints on body, note if they could have been produced by deceased or assailant.

7. Look for marks of *external violence*. Do they fit in with those on the clothes? Were they caused ante mortem? If any vessel contains anything, or any spillings are noticed, have them cautiously collected and chemically examined.

8. If any *ligature* is found, note—the kind of knot, the manner and position of its application and nature, colour and composition of the material of which it is made.

II. Local Inspection of the surroundings :

1. Was door *locked from within*? If so, what means were adopted for opening it?

2. *Was the deceased at this particular spot* when he died? Or, did he come here from some other place? Could he have the power to come? Was he conveyed hither? If

so, from what direction and distance and by what means? Are there any foot-prints on ground? If so, how many, and their direction? Their measurements?

3. Is *ground wet*? If so, what with? Are any projecting substances (nails &c.) near? Where? At what height?

4. Any *weapon*? [It need not necessarily be bloody. Examine closely its handle and inner parts] If so, its nature and position? How grasped? How far is it from the deceased? With a wound of such extent and fatality, could the deceased have thrown it to such a distance? On which side of the body is it lying? Anything adherent to the weapon besides blood? Is the weapon sharp or blunt, straight-edged or curved or notched? [A weapon may be found at a distance or concealed, though used suicidally, provided that the deceased did not receive a wound that was speedily or instantly fatal]. Any blood on or about the weapon?

5. Any bottles? Any dejecta? Any letters or papers? If so, what are their relative situations in regard to the deceased? Their sources?

6. Do furniture or other objects show marks of *struggle*?

7. Floors, door-ways, walls, and walls near doorways—do they show any stains? If so, what are their colour, shape, measurement, nature? [Cut out these or photograph them.]

8. What are the position and amount of blood on or about the body? The direction it has taken?

II. Autopsy (Medical examination post mortem).

Rules for holding an autopsy. (For steps, see Appendix.)

1. Although no property resides in a dead body, *have a written authority* from a magistrate to do it, and keep it with you till the case is finally disposed of judicially.

2. Have at least two persons to *identify* the body, as the

one you are to dissect, and note down their name, designation and address.

3. Do *not* do it in a *private* house.

4. Do it in *natural* (day) *light*, with all the necessary instruments near at hand.

5. *Never do it until the chief signs of death (rigor mortis, decomposition etc.) have been clearly manifest*, of all which take minute notes.

6. *Write* with your own hand, as you go on, or dictate to another, (looking over the notes yourself as soon as possible) everything you see or do or is shown or spoken to you, in its minutest details. *Preserve* the papers written at first hand as also the exhibits shown to you or obtained by you, after affixing thereon marks of your own for identification.

7. Make no hasty inferences. *However plain may be the cause of death, examine minutely and accurately every part and organ of the body.* Note every trace of disease, injury or abnormality present. [Advanced decomposition should not be an excuse for not performing a P. M. thoroughly, Cr. P. C. § 174 (3) notwithstanding].

8. Only when asked for it, give an *opinion* as to the cause of death, stating in detail, the reasons leading thereto. Do not place much credence on suggestions or reports specifying alleged causes of death.

9. In opening the skull, do not hammer it.

10. Do not *incise parts* of the body injured, but rather, slice them off in layers, such that, all the layers remain held together at one side or spot, from where they can be reimposed so as to be, as much as possible, in their natural relations.

11. Do *not carelessly probe* wounds, specially penetrating wounds.

• (a) **Ascertain Time of Death** from a consideration of—

1. The *temperature* of the body.

2. The condition of its muscles (*rigidity* &c.).

3. The sites and signs of *putrefaction*.

4. The condition of *food in the stomach* at the time of examining the body. (See Appendix—Digestion Time-table)

(b) **Establish Identity*** of the deceased—if not yet established, by noticing *personal peculiarities*, like :—

1. *Complexion* of skin.—Note if colour is fair, dark etc., if freckles, pimples &c. are present ; if stout or lean.

2. *Features*.—The general expression of the face is altered after death, but the details of features remain. Look for family likeness, resemblance to parents or portraits.

3. *Eyes*.—Note their setting on the face, their inclination, colour of irides, length of eyelashes, character of pupils, squint or other peculiarities, &c.

4. *Ears* and their lobes.—Note shape, measurements, marks, holes or other peculiarities of setting or form.

5. *Nose*.—Note length, shape, character of bridge, marks of spectacles &c.

6. *Chin*.—Note its shape. Is it projecting or receding ? If any Beard, note colour of hair and fashion of clipping.

7. *Teeth*.—Note colour, number, abnormalities, dentist's interference (filling, removal, artificial teeth &c.).

8. *Hair*.—Note colour, amount, how cut, where shaved, how arranged, if there is any queue present (if so, its length, character) &c.

9. *Birth marks*,—moles, port-wine stains, tumours.

10. *Fingers and nails*.—their condition.

11. Traces of *occupation* or of old *injuries* or *diseases* or *deformities*. [African explorer Livingstone's skeleton was identified by ununited fracture of Humerus].

* Points for identifying individuals, although separated under those of the dead and those of the living, should as a rule, be studied together.

12. *Tattoo marks*: Note (as in case of *scars* too) number, nature, shape, design, colour, consistence, elevated or not, situation, marks of attempts at removal, painful or not.

(c) **Ascertainment of Nationality**—with help of this table :—

HINDUS.

(Males)

Hair of head—if shaved, is left in a *round* tuft at the site of *posterior* fontanelle. Hair is never dyed.

Beard—shaved as a rule, so is the moustache.

Ears—pierced in both lobes after 11th year.

Necklace of beads or sacred-thread present.

Callosities:—there are no special sites for them.

Eyelids—not dyed with black 'surma.'

Palms of hands—not dyed.

Dress—'chapkans' fastened on right side.

Toes—widely spread, corn on inside of first and second toes from use of sandal.

Circumcision—not practised.

(Females)

* *Vermilion dye* at parting of hair.

Tattoo marks between eyebrows.

MAHAMMADANS.

(Males)

Hair of head is completely shaved or left in a *square* tuft in *front* part of crown. Hair *dyed* red by oldish people occasionally.

Beard—preserved, moustache clipped short, or occasionally *dyed* brown.

Ears—not pierced or pierced only on one side.

No sacred-thread, no neck-beads.

Callosities—present on forehead, patella, tuberosity of left tibia, tip of left external malleolus.

Eyelids—occasionally dyed with 'surma.'

Left palm and tip of left little finger dyed with 'hena' dye.

Dress—'chapkans' fastened on left side.

Toes—compressed from wearing of shoes.

Circumcision practised. (after 11

(Females)

None such.

None such.

(Females)

(Females)

Ears—irregularly pierced through fossa innominata and through lobe, in one or two places. *Ears*—regularly pierced on one line along helix and in tragus.

Nose—bored through left ala. *Nose*—bored through septum.

* *Feet*—stained with carmine 'alta'. *Palms*, soles, nails—tinted brown with 'hena' or 'mehdi'.

* *Iron wristlet* and conch-shell wristlet on left wrist. None.

Dress— *Dress*—

(a) 'Sári'—worn single. (a) 'Sári'—worn double.

(b) Trousers—not worn. (b) Trousers—worn.

(c) Shoes—not usually worn. (c) Shoes—worn.

* Found in married females if their husband be alive.

(d) **Ascertain Race.***—from

I. GENERAL CONFIGURATION OF RACES

<i>Caucasian.</i>	<i>Mongolian.</i>	<i>Ethiopian.</i>
<i>Skull</i> —rounded ...	Squarish ...	Narrow, elongated.
<i>Forehead</i> —raised...	Inclined. ...	Small, compressed
<i>Facial portion</i> —smaller than forehead.	Large and flattened; malar bones are prominent.	Malar bones and jaw projecting. Teeth placed obliquely.
<i>Upper extremity</i> ...	Small ...	Longer than trunk. Forearm longer than arm. Hands small.
<i>Lower extremity</i> ...	Small	Leg longer than thigh. Feet wide, flat; heel projects backwards.

2. "CEPHALIC INDEX"—i.e., measurement of the greatest width of the head, multiplied by 100 and divided by length. If this is 70 to 74·5, the head is elongated (*dolichocephalic*); if

* The Indians partake of Ethiopian and Caucasian characteristics.

it is 80-84.9, it is *brachy-cephalic* ; if it is between 75 and 80, it is *mesati-cephalic*.]

3. ANATOMICAL PECULIARITIES OF SKELETON :—

In Asiatics.

In Europeans.

<i>Lumbar vertebral bodies</i> are thicker behind by 8 mm.	They are thicker in front by 5.6 mm. (after puberty).
<i>Index of lumbar curve</i> is 106-8.	It is 96.
<i>Articular surface of sacrum</i> is formed by 2 vertebræ.	Formed by three vertebræ.
<i>Ischial portion of facies lunata</i> (acetabulum) is larger	Is of comparatively less size.
<i>Neck of femur</i> is longer ; upper surface of internal condyle of femur is partly articular.	Neck, shorter comparatively ; upper surface of internal condyle of femur is not articular.
<i>Cubic capacity of skull</i> is 1360 cc. or under.	From 1500 cc. or upwards.
<i>Weight of skeleton of—males</i> is variable ; females, 6lb 2oz.	<i>Weight of skeleton in—males</i> 10lb 6 oz, females, 8lb 13 oz.

4. 'MONGOLOID PATCH'—*i.e.*, an irregular blue patch on the sacral (lower) region of infants—is very often found among persons of Mongolian race—but is by no means exclusively confined to them.

(e) Ascertain Age*—*If body appears to be under 25 years*, apply—(i) Dentition table. (ii) Ossification table. (iii) Table of Union of epiphyses with shaft. (iv) General configuration test. *If body looks like that of an adult*, apply—(i) General configuration test. (ii) Height-and-weight-ratio table. (iii) Degenerative changes table.

* *The Phases of Life* : (1) *Infancy*—from birth till 7th or 8th month. (2) *Childhood*—from 7th or 8th mo. till 7th year. (3) *Youth*—from 8th year till 20th year. (4) *Adult age* from 20th year to 40th year. (5) *Old age*, after 60th year.

(i) TIME-TABLE OF DENTITION (European).

				<i>Month.</i>	
Temporary.	Lower Central Incisors	cut	...	4th—	7th
	Upper Lateral	"	...	7th—	9th
	Upper Central	"	...	8th—	10th
	Lower Lateral	"	...	10th—	12th
	Anterior or first Molars	"	...	12th—	15th
	Canines	...	...	18th—	24th
	Posterior or second Molars	"	...	20th—	30th
				<u>Indian</u>	<u>European</u>
				<i>Year.</i>	<i>Year.</i>
Permanent.	First Molars	...	...	6—7	6—8
	Central Infer. Incisors	...	...	7	7—9
	" Super. "	...	...	7	6—8
	Lateral Incisors	...	...	8—9	8—10
	Anterior Bicuspid	...	...	9—10	9—11
	Canines	...	...	10—13	11—13
	Posterior Bicuspid	...	...	10—12	12—16
	Second Molars	...	...	11—12	10—15
	Third Molars	...	...	14—27	17—30

[Regarding dentition, remember that—(a) it *first appears* in lower jaw ; (b) it is *delayed* by rickets ; (c) it is *anticipated* by congenital syphilis ; (d) rarely, a child may even be *born with teeth* ; (e) *Hutchinson's teeth* belong to the permanent set ; (f) in the *milk-teeth*, as compared with *permanent ones*,—(i) a ridge marks the junction of fang with crown, (ii) the anterior teeth are vertical (permanent ones being somewhat forward inclined), (iii) the molars are bigger than the bicuspid ; and (g) the *order* rather than time of eruption of teeth is fixed.]

(ii) GENERAL CONFIGURATION OF BODY AND CHANGES AT PUBERTY. [For the latter, see Chap. on 'Impotency']

(iii) **DEGENERATIVE CHANGES**—See 'age in the living.'

(iv) **HEIGHT AND WEIGHT RATIO**—See Appendix.

(v) **APPEARANCE OF 'CENTRES' OF OSSIFICATION IN BONES.**

Vertebrae (a) In Laminæ 6th week (foetal life). (b) In Body 8th week (foetal life). (c) In Transverse Process—16th year.

Hyoid : Body—8th month (foetal).

Clavicle (a) Shaft, 30th day (foetal). (b) Sternal end, 18th year

Scapula : (a) Body—8th week (foetal). (b) Acromion & Coracoid processes, 14th to 16th years.

Humerus : (a) Shaft—8th week (foetal) ; ossified at birth. (b) Head—1st year (c) Tuberosities—3rd year (d) Internal condyle—5th year (e) Trochlear—12th year (f) External condyle—13th to 14th year.

Radius : (a) Shaft—8th week (foetal) ; ossified at birth (b) Lower End—2nd year (c) Upper End—5th year.

Ulna : (a) Shaft—8th week (b) Lower End—4th year (c) Olecranon Process—10th year.

Pisiform—after 12th year.

Femur : (a) Shaft—5th week (foetal). (b) Lower end—9th month (foetal). (c) Head—1st. year (d) Great Trochanter—4th year (e) Lesser Trochanter—14th year

Tibia : (a) Shaft—7th week (foetal) (b) Upper end—1st. year (c) Lower end—1st to 2nd year.

Fibula : (a) Shaft—8th week (b) Lower end—2nd year (c) Upper end—4th year.

Inferior Maxilla—5th to 6th week (foetal).

Parietal Eminence—7th to 8th week (foetal).

(vi) **OSSIFICATION AND UNION OF SHAFTS WITH EPIPHYSES.**

(as determined by X-Ray) :—

(a) *Intra-uterine* :—6th month—os calcis ; 7th month—astragalus.

(b) *At birth* (9th month) Cuboid, Femur (lower end).

(c) *Extra-uterine* :—

1st year—‘Centres’ in Heads of Tibia, Femur, Humerus ; in External Cuneiform (foot), Unciform, & os Magnum (hand). ‘Union’ of 3 pieces of Temporal bone ; and of posterior arch to body of vertebra.

2nd year—‘Centres’ in Lower Ends of Tibia, Fibula, Radius ; in Symphysis of Jaw, end of Metacarpal and Metatarsal bones. Anterior Fontanelle ‘closes’ bet. 15—18 months.

3rd year. ‘Centres’ in Great Tuberosity of Humerus, Patella, ($2\frac{1}{2}$ years) Internal cuneiform (foot), Cuneiform (hand), Cuboid, head of Metatarsals and Metacarpals. Odontoid Process ‘joins’ axis

4th year. ‘Centres’ in Great Trochanter of Femur, upper end of Fibula, middle Cuneiform (foot), base of Phalanges. ‘Union’ of Styloid Process to Temporal.

5th year. ‘Centres’ in Scaphoid, Lesser Tub. and Int. condyle of Humerus, Semilunar (hand) ; Trapezium (hand).

6th year. ‘Centre’ in Scaphoid (hand). ‘Union’ of Rami of pubes to ischium and of all parts of Occipital bone.

9th year. ‘Centre’ in Trapezoid. Ilium, Pubis and Ischium ‘meet’ (but not unite) in acetabulum.

10th year—‘Centres’ in os Calcis, Ulna (upper end).

12th year—‘Centre’ in Pisiform (hand).

13th year—Ilium, Pubis and Ischium ‘unite’ but are separable. Patella ‘ossified’ so is *Ext. condyle of Humerus* (Quain).

15th year—‘Union’ of Coracoid process to scapula.

16th year—‘Union’ of *Olecranon process to ulna*, *Epiphyses at knee-joint* and *External condyle to shaft of Humerus*. (Powell).

17th year—Internal condyle ‘unites’ to shaft of Humerus.

18th to 20th year—‘union of’ Head of femur to shaft and the epiphyses of the long bones of hand and foot and of fibula ‘unite’ to their shafts. Occipital ‘joins’ to Sphenoid.

25th year—'union' of Epiphyses of sternal ends of clavicle and of ribs to the body of the bones

Over 25 years—all the epiphyses in the body are 'united'

Between 25-30 years—first sacral vertebra 'unites' with the others.

Over 35 year—all the parts of sternum are 'united.'

(f) **Determine Sex.**—(1) EXTERNAL CONFIGURATION :

The body is that of female if—

- (i) *Vagina, uterus, ovaries*—are present
- (ii) *Pubic hairs* are less dense and do not extend to navel.
- (iii) *Hair on face*—absent.
- (iv) *Breasts*—developed. (But beware of gynomastia).
- (v) *Hips* are wider than shoulders.

[The opposite of these will apply to male bodies.]

(2) IF FRAGMENTS OF ONE DEAD BODY ARE RECEIVED :

They belong to a female if—

(a) *Bones* are lighter, thinner, more cellular, smaller and less ridged. [Hence, bones of a small adult young woman may be mistaken for those of a boy.]

(b) *Skull-bones* are smaller, more contracted in front, their base narrower in proportion to parietal measurements and forms a longer oval from before backwards. Jaws are narrower, and the chin is less prominent. (c) *Joints* are smaller.

(d) *Thorax*—ovoid, shorter, deeper, wider, (about 4th rib). *Ribs* are obliques, smaller; their cartilages, longer. Body of *sternum* is greater than twice the length of manubrium, but *sternum* as a whole is shorter, more convex and terminates opposite 4th ribs.

(e) *Vertebral column* is longer; the bodies of *vertebræ* are deeper. Lumbar curve is longer and lumbo-sacral angle is greater.

(f) *Pelvic bones* (after puberty)—are lighter, thinner, smoother; pelvic cavity is shallower, wider; its outlet larger; its brim is wider and ovoid.

- (1) *Ilia and tuber ischii*—are widely separated, and *ilia* are horizontal.
- (2) *Pubic arch*—wider, (90°) and *pubis* shorter.
- (3) *Edges of pubic arch*—are everted.
- (5) *Obturator foramina*—triangular, larger, obliquer.
- (6) *Sacrum*—is more concave and the sacral curve involves lower end of sacrum only.
- (7) *Acetabula*—are wider apart.
- (8) *Coccyx*—is mobile and turned backwards.

III. Chemical Examination of: (A) Contents of viscera :—This is done by the provincial Government Chemical Examiner, to whom viscera are sent by peon or post.

IN SENDING VISCERA AND CONTENTS, have *new*, chemically *clean*, wide-mouthed jars with tight-fitting stoppers. Into each jar put only *one* of the several items given below. Then let each jar be *well secured*, distinctively *numbered* and *labelled*, *sealed* with your private seal and *initialled* by you: [Never pack viscera tightly into a small jar; never put the viscera of more than one case into the same jar]:—

- | | |
|---|-------------------------|
| 1. Stomach. | 2. Contents of stomach. |
| 3. Small intestines with contents (specially in poisoning by vegetables e.g., dhatūra). | 4. Brain, Spleen. |
| 5. Liver and Kidneys. | 6. Urine. |
| 7. Bile. | 8. Blood from heart. |
| 9. Uterus and foreign bodies found in it (in abortion cases). | |

[In adults, the liver is the chief accumulator of poisons. In the foetus, however, arsenic accumulates in the skin; copper in liver, skin, brain and cord; lead in liver, skin and nervous centres; copper and mercury in placenta; hence, in cases of foetus, send *placenta and skin too.*]

Preservatives to be added to prevent decomposition :—

1. Rectified Spirit (except in P, alcohol or carbolic acid cases.)
2. Perchloride of mercury solution or Formalin.
3. Saturated NaCl solution, where spirit or formalin is not available and in suspected Alcohol poisoning.)
4. Chloroform (if viscera are from exhumed bodies.)

[**Note :—**Always (a) send separately a covering letter detailing *history, symptoms, postmortem account*, an impression of your private seal used, the *contents* of each jar and the nature of the *preservative* added to each, and the weight and *manner of packing each*; and (b) obtain a receipt from the person to whom you hand these over.]

(B) **Of Stains.**—Send entire (and not cut pieces of) garments, with the magistrate's letter permitting such removal, and knives &c. found. *Stitch* distinctive labels to garments or *tie* them with sealed cords to knives &c. sent. If convenient, send also *slides* containing blood, seminal fluid, vaginal discharge &c. (as the case may be) obtained by you from the victim. [Same precautions as to *packing* and writing a *covering letter* are to be observed, in these cases (but do not use yellow wax-cloth, which contains As); only, *dry* the stain before packing, do not add *preservatives* but see that the stains do not get crushed or folded or crumpled—pad each side of a stain with thin layer of wool.]

(B) IDENTIFICATION OF MUTILATED CORPSES OR BONES.

Questions to be settled, in reference to a *missing individual of known sex, age and height* :—

1. Are *all* the parts *human* ? [No animal bones ?]
2. If so, do they all belong to one and the same *individual* ? (Do they fit in with one another ? Are there duplicates ?) If so, of what *race* was he ?
3. What *side* of the body do they belong to ?
4. What was the *height* of the individual ?—Height is determined approximately (within 5" of error) from any of these :—

(a) Add $\frac{1}{2}$ " to the full length of skeleton. (b) Length of whole upper limb $\times 2$ (sides) + 12" (clavicle) + $1\frac{1}{2}$ " (sternum). (c) Length of Femur $\times 2.75$. (d) $2 \times$ length of whole lower extremity. (e) $2 \times$ length upto symphysis pubes.

5. What was the *sex* of the individual ? [skeletal peculiarities ?]
6. What was the *age* of the individual ? (See ante, p. 41.)

After these general points, look for **peculiarities** :—

7. Do the bones bear *signs of injury (during life)* or of *disease* (rickets, syphilis, ankylosis spinal curvature) and are they brittle ? Or of surgical interference ?
8. Have the parts been *roughly handled* (eliminate such possibilities during digging up) ? If so, how ? Were they *gnawed* or *sawn*, *torn*, *shilfully manipulated* e.g., *hammered*, *cut cleanly* boiled limed, salted etc., ? [Bones *burnt* in air are white ; bones burnt in closed space are black or grey. Burnt bones preserve their shape but are easily friable and leave charcoal only on treatment with HCl.]

9. Are earth or other *matters adhering* to the bones ?
 [Preserve samples of such substances]. Do the bones emit
odour of recent death or of long interment ?

10. In what *position* has the skeleton been discovered ?
 Was it lying as in a coffin ? And what locality was it in ?
 Was it a burial ground ?

[It is impossible to fix the duration of time during which
 a bone has lain buried. It depends on—age of the individual,
 depth of burial, nature of the soil and the amount of mineral
 matter present in the bones.]

(C) IF A BODY HAS TO BE EXHUMED :

Duties of medical men.—The procedure of autopsy is the
 same as for unburied corpses, save for the following :

1. Obtain *written permission* from a magistrate, before you
 do it. Do it in *day-light*.

2. *Be present at the grave-yard* all the while exhumation
 is going on.

3. Note the *kinds of soil* and if coffin is not entire, secure
 some earth from above and below where the coffin lay.

4. Have some reliable persons (among them, the *carpen-
 ter*) to identify the *coffin*, and the *corpse* as that of the particular
 individual whose name is on the written authority.

5. Do not sprinkle any disinfectant *over* the body but
 you may do so *around* it. [Simple exposure of the body to
 the air is quite enough to deodorize it].

6. Perform thorough post mortem examination and *pre-
 serve some hair of the face* for identification and all wounded
 tissues. Note the *position* in which the corpse was lying.

7. Seal up viscera in jars instantly (*without preservatives*) ;
 —do not allow viscera to come in contact with any metallic or
 other vessels that are not known to you to be absolutely clean.

(D) IDENTIFICATION OF THE LIVING.

I. Of the individual.

[Take *precise* and *copious* notes of : (a) date, hour, place of examination ; (b) consent obtained ; (c) name, age, sex, caste, occupation, height, weight and chest-girth of the person ; (d) name, age, sex, caste, occupation and special identification-characteristics of witnesses or identifiers ; (e) history of past diseases, injuries &c. (f) Use such instruments as you require] :

Necessary in cases of :

- (a) Supposititious *claimants to estates, pensions etc.*, who appear suddenly, after alleged absence. [Case of E. I. C. v. Pratap Chand, 1835, Hugli. Roger Tichborne case, 1874]
- (b) Supposititious *claimant to a girl* as his own wife. [Case of Arnauld de Tilh.]
- (c) *Arrested person, who disowns his guilt*, as being a case of mistaken identity [Case of Adolf Beck, 1904].
- (d) Some corpse being set up as that of a *missing individual*, who is supposed to have been murdered. [vide Bengal Nizamat Adalat Report I. 1853, p. 259].

Means of ascertaining :—By carefully noting—

1. Mental power, memory and education of the individuals. [This helped in the Roger Tichborne case.]
2. Speech—in regard to

(a) *Voice*—the timbre of which is largely dependent on the characters and number of overtones. Hence, it is easily altered by accident, false teeth, disease &c. [A *ventriloquist* can imitate almost any speech or sound.]

(b) *Defects of speech*—e.g., lisping, stammering &c. [This is best recognised when one is speaking excitedly or is quarreling. Stammering for which there is no organic

cause, is curable ; but defect of speech or voice dependent on local organic defects, are cured by operation ; they may also be due to nerve lesions, like general paralysis of the insane, disseminated sclerosis, etc.]

3. **Gait.**—Alteration may be caused by organic changes. Note—Mannerisms, if present.

4. **Hand-writing.**—See Appendix.

5. **Complexion and features.**—Vide p. 38.

6. **Marks of—**

(a) *His occupation*—on different parts of body : callosities, horns, stains. [*Tailors* have ring-shaped callosities on right thumb and index finger : their left index finger and thumb are roughened by the needle-point and there are bursal enlargements over external malleoli. *Carpenters* have callosities on thenar eminence of their working hand and on the dorsal surface of first and second phalanges, and at radial border of index finger. In *clerks*, the skin over outer surface of terminal joint of right little finger is thickened. *Compositors* have thickening on working hand. *Chemists, dyers, painters* etc. have stains on their hand.]

(b) *His religion*, e.g., callosities on certain parts of body, circumcision, perforations in ear and nose &c.

(c) *His race.*—Jews and Mahammadans circumcise penis.

(d) *Deformities* (personal) e.g., absence or abnormalities of teeth, peculiar formation of jaw, harelip, club-foot, cleft palate, talipes, squint &c.

(e) *Injuries and diseases*, e.g., badly united fractures, amputations, scars of healed scrofulous glands etc.

(f) *Congenital*—Mother's marks, moles, &c.

(g) *Peculiarities in his dress* &c.—e.g., fondness for certain colours or certain articles of dress or jewelry or peculiar ways of wearing certain articles of dress.

(h) *Tattooing.*

7. **Bertillonage** (Criminal Anthropometry)=a system of classifying individuals according to (a) certain measurements, viz., of the length and breadth of the *head*, the lengths of *left middle finger*, *left forearm*, *left foot* and the *height of body* (b) characteristic *colour of irides* &c. These measurements remain constant throughout life from adolescence, but the method of recording them is obviously faulty.

8. **Finger Print** (Galton-Henry).—A printing-ink-impression of the finely dotted papillary ridges (not the creases) on the ball of one's finger is obtained as a means of identifying him. The details of the ridges constituting the patterns of finger-impressions (*peculiar to each individual*) *persist unvaried from birth to death* until decomposition sets in ; some of these patterns are even hereditarily transmissible. These ridges are never obliterated unless from injury or disease the sweat-glands lying below them are destroyed or unless, callosities form there. Act V. of 1899 (Supreme Council) recognizes this mode of evidence. For purpose of sorting (among 1024 possible combinations of digits), the pattern of "rolled" instead of "flat" or plain prints of *all* the fingers were classified into (a) Loops (60%), (b) Whorls and *Composites* (35%), (c) *Arches* (5%) ; arches having been incorporated with loops and composites with whorls, the two main classes to-day are—*Loops* and *Whorls*. There are fixed points in these impressions, called (a) *outer terminus* or delta and (b) *inner terminus* or core. The impressions of ten digits are taken in pairs as follows (care being taken to include one delta in the case of loops and two deltas in cases of whorls) : (1) right thumb and index, (2) right middle and ring, (3) right little and left thumb, (4) left index and middle and (5) left ring and little. Given 10 impressions in the above order, they may be expressed as follows :

L	W	L	W	L ³
W	L	L	W	W

And this formula converted into actual numerical counts easily

fixes the cabinet wherein the impression is to be found. (In 1889, murderer Kangali Charan, was identified by his right thumb impression, left on a book of the victim). [*Thumb prints can be forged by taking impression of them on damped paper.*]

9. By measurements of height and weight.—These notoriously vary, and are therefore unreliable.

10. By examination of Teeth—as to their extent and manner of use (with care or neglect), colour, abnormalities of number or position, details of the dentist's work (stopped, filled or artificially replaced). [Murdered victim's identity fixed, in cases of *Dr. Webster v. Dr. Parkman*, 1850. *R. v. Ross*, 1831].

11. By examining hair,—in regard to colour, nature, size, how cut, where shaved, how arranged.

II. Of Sex. [*See chapter on Sexual Relations*].

Definition.—A *Male* must possess at least one testicle that can emit fluid containing spermatozoa. A *Female* must have at least one ovary, and must menstruate. [Dr. James Barry, Staff Asst. Surgeon and Inspector of Hospitals (1775—1865) was a female but had the external features of a male].

Necessary in cases of—

1. Malformed children—where their *identity* is doubted.
2. *Succession to estate*—where males alone are eligible. Hermaphrodites 'succeed according to the kind of sex which doth prevail'.

3. *Education*.—Is an individual to be educated as a male or as a female?

4. *Marriage*.—Is an individual to marry as a male or as a female? Can an individual *divorce*? Is an individual the *parent* of a child?

5. *Exercise of civic functions*—e.g., capacity for voting—where males alone can vote.

Means of ascertaining : By examination of—

(a) General configuration of body, condition of breasts, presence or absence of hair on face, length of hair of head, thickness and extent of pubic hairs, depth of voice, habits, sexual instincts, dress etc., relation between width of hips and shoulder.

(b) Genitals—with reference to presence of spermatozoa in semen or of menstrual discharge.

III. Of Age.

Necessary in cases of—

1. *Doubtful identity*—of an heir to an estate.
2. *Infanticide*—to ascertain whether a dead infant had arrived at 'viable period.'
3. *Rape*—to determine capacity for giving consent.
4. *Commission of crimes*—to determine if the party understands his or her responsibility and can stand trial or not. [I. P. C. §§ 82, 83].
5. *Marriage*—to ascertain if a person is fit to marry or possesses capacity to procreate, with regard to questions involving legitimacy, impotence, etc.
6. *Exercising certain lawful functions*, e.g., pledging credit, borrowing money, making a will, giving evidence, obtaining certain employments, passing beyond the scope of certain laws—Factory Act (XV of 1881), University Act, Emigration Act.

Means of ascertaining : By examining—

1. *Horoscopes and birth-registers* or certificates.
2. The *teeth* that have cut. (*vide* Dentition table).
3. The *height and weight* ratio. (*vide* Appendix).
4. *General configuration* of the body.
5. *Changes of body at puberty* (see under 'Impotence and Sterility').

6. *Degenerative changes*:—(a) wrinkling of skin, (b) grey hair, (c) falling of teeth, onset of (d) long-sight (e) arcus senilis (f) atheromatous state of blood vessels, (g) ossification of costal, laryngeal and xiphoid cartilages, (h) absorption of alveolar margin of lower jaw and lower maxillary bone assuming an obtuse angle, (i) thinning of skull bones (j) sinking of head of the femur.

7. *Ossification in or union of epiphyses* to bones as ascertained by X-Ray examination. (See ante, pp. 43—45).

MEDICO-LEGAL POINTS RE IDENTIFICATION.

Scars.

Cause:—A scar is the consequence of (visible or invisible) breach of continuity of skin. **Composition**.—It is composed of simple *fibrous* tissue, with a variable, though usually a poor, supply of blood vessels. It is devoid of pigments, hair-follicles, sebaceous or sweat glands. **It is detected by**—(a) naked eye, when prominent or recent; (b) rubbing the part so as to redden the surrounding area; and (c) microscopic examination. **In examining a scar**, note—its exact measurements, form, colour, situation, relation to the level of surrounding skins, its mobility and whether painful or not.

Disappearance of a scar is not possible, unless very *small* or *linear*. Scars which are the result of disease (syphilis, small pox, vaccination, carbuncle, lupus, scrofulous ulcers etc.,) or of crushing injuries, or of burn, blisters, setons, issues etc. never disappear to the naked eye. *Age, friction, use of irritants, pressure &c.* may **modify** a scar, as regards its shape, size and prominence. Position and character may also be **altered by cutting**: A bad unsightly scar may be removed or remedied by plastic surgery, but such an æsthetic possibility does not minimise the guilt or responsibility of the individual who caused the wound.

Age of a scar.—It is safe not to swear to it ; but, probably, a scar that is—

Red—is 2 to 4 weeks old ;

Brown or Coppery—is more than 1 to 2 years old ;

White and glistening—is of unknown age.

Process of scar formation:—*Age, state of health, constitution, cleanliness, nature, size and situation* on parts liable or not to constant friction or muscular movements, materially influence it.

Time-table of the process:—(a) In small superficial wounds—a week. (b) In aseptic, incised, surgical cuts—scar forms in less than 2 weeks. (c) In large irregular wounds—over 3 weeks. (d) In suppurating wounds—between 2 weeks and 3 months.

A scar generally bears the character of the original wound from which it results. *Leech-bites* are tri-radiate ; *surgical incisions* are regular and situated on parts that tell their tale ; *vaccination* scars are honeycombed, central depressions ; *small pox* scars are deep, circular depressions ; *scrofulous* and *syphilitic* scars are puckered, thickish and depressed ; *burns and scalds* show keloid patches, and so on.

Mother's marks.—They can be removed by—

(a) Surgical means (leaving scars),

(b) Electrolysis or by painting with CO_2 -snow—without rendering skin abnormal.

Tattoo Marks.

Significance.—*Virile* people like sailors and soldiers are fond of tattooing. But *idlers* may have it done from their fondness for imitation. **Dangers.**—Syphilis and tuberculosis have been communicated from man to man by the process.

Materials for tattooing—in the decreasing order of their permanence, are :—gun powder, indigo blue, vermilion, blue ink, ultramarine, indian ink, powdered charcoal, lamp black. *Faded* marks are rendered visible by friction. **Removal** is effected

with the help of blisters ; alternate applications of KOH and acetic acid ; unripe papaw juice ; iodine ; HCl dil. ; actual cautery, etc. (a) If the tattooing is done only into the cuticle and by some soluble material, it may **spontaneously disappear** (*but seldom under ten years*) ; and in that case, the colouring matter is found deposited in the *nearest glands* (b) If however, it is done into the papillary layer of true skin, its removal by artificial means will leave a *scar* which is sunk below the surface-level. (c) It is impossible to efface the black mark caused by the *grains* of **gun powder**, while marks made by its *smoke* on skin or fabrics are easily obliterated, by painting the parts first with NH_4I , and then with dil. HCl.

Hair.

Is it hair at all? This it is essential to have settled. For, hair may be, by naked eye, confused with certain *vegetable*, fibres and *animal* hairs. Use microscope. If it is human, ascertain the part of body it has been derived from.

Change of colour. (a) Hair resists putrefaction : hence, long *after interment*, it can be identified by its colour. [Case of Dick of Nuddea, 1830] (b) Excessive grief, fright, emotion, anxiety or pain can *suddenly turn white* in patches hair of head. (c) Working in an atmosphere of copper dust, causes change of colour of hair. (d) It is *bleached* by hydrogen peroxide or by chlorine, in presence of moisture (Complete bleaching process occupies 10 to 12 hours). (e) Partially bleached black hair will look fair or light golden coloured. (f) It is *dyled* white by flour mixed with grease, or black, by soot, salts of silver, bismuth or of lead. [Metallic dyes may be tested for in—(1) ash left after incineration or (2) the dried residue left after digesting hair in HNO_3 dil.]

Characters of bleached or dyled hair : (a) If *bleached*, hair is unnaturally glossy and brittle. (b) If *dyled*, microscopic

examination will reveal portions undyed. (c) *Whether bleached or dyed*, not all the hairs on the body are of the colour of the hair of the head. (d) Their roots escape dyeing and bleaching, and the scalp may get stained.

Post Mortem Growth of hair and of nails and change of colour of hair are also known.

Removal of hair.—Done by *shaving* or applying *depilatories* like—(a) yellow sulphide of arsenic and lime; (b) barium sulphide 1 dr. diluted with zinc oxide and starch of equal volume.

Ears, Nose, Eyebrows, Lips :—

Their *shapes* can be altered by operation but such operations leave scars. Always *measure* them.

Recognition.—A *flash* of pistol or gun fire or of lightning, is sufficient to enable an observer to distinctly discern another in the dark, provided—(a) there is absence of other light, (b) observer is in close proximity (say 5 paces) to the discharge, (c) he is on one side of the line of fire (d) he is stooping (e) the powder does not emit much smoke and (f) the discharge occurs in a small, close space. During excitement, vision and hearing become acuter.

(E) SURVIVORSHIP.

Questions arise.—Whenever two or more persons, natural heirs of each other, *perish by the same event* (drowning, explosion, burial etc.), without the possibility of knowing which died first, questions of survivorship arise; because, when a party dies possessed of property, the right to that property passes to his *next-of-kin*, unless it be shown to have passed to another by survivorship—as, in such cases, a few seconds' survival transfers the property of the predecessor in death to the survivor, and, through him, to the claimants on his part.

Legal aspects : The *English* law does not presume the pre-decease of any one, but decides on facts and direct evidence, where available. In the absence of any, however, law presumes that the superior in *physique, strength, vitality and sex* survives his inferior. Thus, a husband survives the wife ; a son above the age of puberty, his parents ; a baby its mother. *Mahammadan* law assumes that all die at the same time.

Medical aspects : No rule of thumb can be laid down to determine survivorship. The body attains *full growth and strength* between 25th to 30th years and continues strong and *vigorous upto 50th*. *Women* are liable to fainting easily, and fainting prevents asphyxia ; also women, consuming less oxygen, ought to outlive men with the same quantity of air inside their chest. The presence of *wounds, of heat, rigor mortis* etc. in one may only help us to a conclusion, if these are absent in the other.

[**Presumption of continuance of life**—of a person not heard of, ceases at the end of *seven* years, commencing from the date last heard of, without prejudice to any special circumstances accompanying it. [I. E. A. §§107, 108.]

CHAPTER IV.

ASPHYXIAL DEATHS.*

(A) GENERAL CONSIDERATION.

Causes.

I. **Physical Conditions**,—(1) referable to brain—*e. g.*, injury or hæmorrhage into brain or medulla ; poisoning by

* *Asphyxia* is a condition of insensibility due to defective æration of blood (less oxygen, more CO_2). *Apnœa* is a condition of suspended res-

CHCl_3 , CO_2 , Opium, etc. ; division or compression of vagus or phrenic nerve ; hæmorrhage.

2. **Referable to Respiratory mechanism :** (a) *Oedema* or *spasm* of respiratory muscles—from hydrophobia, tetanus, strychnine or curare poisoning, inhalation of pure Cl , CO_2 , SO_2 . (b) pneumonic consolidation (double), or embolism of pulmonary artery ; (c) *exhaustion or paralysis* of muscles of respiration from cold, debility or disease.

II. Mechanical means—

1. Closure of *orifices* of air passages by covering the mouth and nose, as in suffocating.

2. Closure of *air passages* themselves, (a) from 'within'—by plugs or liquids ; or (b) by pressure from 'outside'—as in hanging, strangulation, throttling.

3. Embolism or thrombosis of pulmonary artery.

4. Prevention of respiratory movements of chest—(a) *from without* by rolling bamboo over it ("Bans-dola") or by applying weight to chest or by squeeze ; (b) *from within*, as in pneumo-thorax.

Symptoms & Stages :

I. **Asphyxia Livida** (*recoverable*) : (1) *Dyspnoea* gradually increasing (for a minute), followed by, (2) *unconsciousness* and *convulsive breathing*—at first both of inspiration and expiration and finally, of inspiration (for 1 minute) with gradually decreasing efforts. Then—

II. **Asphyxia Pallida** (*recovery doubtful*) : Gradual and steady paralysis of respiration, generalized convulsions and deepening coma. Finally heart stops.

piration, owing to over-aeration of blood. *Eupnoea* is the condition of normal easy breathing. *Hyperpnoea* is deep breathing. *Dyspnoea* is respiration with the help of extra-ordinary muscles of respiration. *Orthopnoea* is a condition of respiratory difficulty eased only by sitting up.

[As a rule, if breathing has stopped for over five minutes, heart does not recover, except in cases of asphyxia in cold temperature (drowning) and of new-born babes.]

Post mortem appearances. [These vary according as the *first* (*dyspnœic*) stage or the *second* (*convulsive*) was prominent in life : intensity of dyspnœa induces congestion of viscera : that of convulsions, petechial ecchymoses] :—

External Inspection :—

1. *Body cools slowly*—because of generation of heat post mortem or owing to hard struggles preceding death.

2. *R. M.*—is slow of onset and of prolonged duration (if muscles were not exhausted by severe antemortem struggles).

3. *Death stains*—appear early and are well-marked.

4. *Swelling & Cyanosis of*—face, ears, lips, skin and nails (non-dependent parts). This may disappear owing to gravitation. *Bleeding*—from nostrils, mouth and ears.

5. *Tongue* is swollen, cyanosed and protruded against, or caught between, teeth. *Lower jaw* is retracted. [As protrusion of tongue is the effect of asphyxia, or of putrefaction, it bears no relation to the position of ligature on neck].

6. *Petechial ecchymoses*—about scalp, face, lids, lips, nose, neck, shoulders etc.

7. *Pupils* are normal. *Eyes* are protruding and brilliant,—specially in death from strangulation. Eyelids are open and injected (if much violence attends hanging)

8. *Relaxed Sphincters*,—hence, urine and foeces are voided. [Also found in death from gunshot or shock.]

9. *Congestion of Genitals* :—hence, priapism, emission of semen ; redness of labia with bloody discharge from vagina.

Internal Examination :

1. *Blood* is fluid, and dark (from reduction of hæmoglobin), coagulating slowly (owing to excess of CO_2).

2. *Venous System* (entire) is engorged ; \therefore , right side of *Heart* and pulmonary artery are engorged with venous blood. [In late autopsy, right heart may be found empty from effect of rigor mortis on contents of right chamber]

3. *Bloody froth and mucus in trachea.*

4. *In the lungs* :—(i) Congestion and oedema or (ii) superficial emphysema or hæmorrhages. (iii) Tardieu's spots and (iv) Venous condition of blood are met with. [(a) If death has taken place slowly, the lungs are much congested and the heart, in all its chambers is moderately distended with blood. (b) If death has been rapid, lungs may be quite anaemic and the heart distended almost to bursting. The condition of the lungs varies inversely with that of the heart. (c) In rare instances, the right ventricle is contracted and empty, the lungs being congested in an extreme degree.]

5. *Petechial capillary hæmorrhages** are found beneath the serous coverings of various viscera. *Conditions favouring their occurrence are* : (a) rapid asphyxia, (b) asphyxia attended with much convulsion and (c) delicate state of tissues, as those of infants ; hence found in deaths from drowning, hanging, strangulation, heart disease, pneumonia, apoplexy, scarlatina, still-birth, and even in the unborn child. *Their usual sites are* : at back of heart, in mucous membranes of respiratory tract (larynx, trachea), beneath dura mater, on pia mater, in conjunctiva, or scalp, along posterior surface and beneath root, of aorta. Hence, Tardieu's Spots—

(a) *If absent*, do not negative asphyxia, but merely negative severity of convulsive stage of asphyxial death.

* Capillary hæmorrhages occurring subpleural are called *Tardieu's Spots*. *Puncta cruenta* or *P. Vasculosa* = dots of hæmorrhage studding cut-surface of white matter of brain. *Petechiae* = purple spots produced by hæmorrhage or transudation of colouring matter of blood into tissues. Their colour does not fade on pressure

(b) *If present*—(1) death from want of air in lungs (asphyxia) with severe convulsion or, (2) diseases (like scurvy, hæmophilia, purpura, etc.) or accidents attended with rupture of organs (as in fall from heights or gunshot wounds) or (3) very prolonged post mortem hanging.

[These spots do not disappear as the effect of gravitation].

6. *Brain* may be anaemic or congested. 'Puncta cruenta' are noticed in the brain, when cut into. [If death occurs at the end of Inspiration, brain is congested and there is very little blood in the lungs; but, if at the end of Expiration, there is much blood in the lungs and little in the brain].

7. *All viscera* are congested in their most dependent parts.

(B) HANGING.

Definition : Death by suspension of body by the neck, the constricting force being the weight of the body or of the head. [Hanging is possible in sitting or kneeling posture.]

Causes of death :

1. *Asphyxia*—if air passages are occluded (low ligature).
2. *Apoplexy*—from compression of vessels (high ligature).
3. *Syncope*—from pressure over vagus nerve.
4. *Injury to spinal cord* (as in judicial hanging) from fracture-dislocation of odontoid process of axis.

Time taken to die :—

(1) *Instantly*—in fracture-dislocation of spine or in syncope.

(2) *Slowly*—if from apoplexy.

(3) *Rapidly*—if from asphyxia. [In *incomplete* asphyxia, patient may live 5 to 8 minutes and has been revived after half an hour's suspension (Tidy)].

Symptoms.

1. *Ocular* :—flashes of light, play of colours or other illusions seen.

2. *Auditory* :—hissing, roaring or other noises heard.
3. *Loss of consciousness* and of *motion* :—Rapid, almost instantaneous, and profound.
4. *Salivary* secretion—increased.
5. *Genitals*—excited and congested.

Treatment : [Never relax efforts and vigilance, even if respiration be established, as *patient may die suddenly* from relapse. *Treat even if hanged for half an hour.* Remember, heart may go on beating 3—5 minutes after breathing ceases.]

I. **Remove cerebral congestion** :—(a) *Cut the body down*, quickly but gently. (b) *Bleed* (upto at most a pint, from a vein) to relieve right heart. (c) *Blister* calves and soles. (d) Pour *cold* affusion to head [Though alternate cold and hot baths remove asphyxia in *children*, in an *adult*, never give warm bath : an adult better survives asphyxia at lower (even 60° F) than at higher temperatures].

II. **Establish respiration*** by artificial means (a) Put out

* **Giving Artificial Respiration** :—[Never use undue violence ; Proceed rhythmically, 12 to 15 times a minute ; remember that pressure on epigastrium may cause stomach-contents to be ejected, which may be sucked into larynx by the next inspiration]. (1) By direct *mouth-to-mouth inflation*,—after closing nostrils and pressing on epigastrium, followed by squeezing abdomen and chest. (2) *Inflation through catheter*. [Note :—These two methods may introduce tubercular disease or cause emphysema or rupture of lung]. (3) *Schuller's* method of digging fingers under costal arch and thence pulling it up and depressing it. (4) *Silvester* or *Forest* method (modified by *Brosch*) :—Lay patient supine with something firm under his back. Pull out his tongue and hold down by his feet ; then gradually pull up both hands till they are by the side of and below the level of, the head. Return the hands again, till, by their means, the lower part of chest can be squeezed. (5) *Schultze's* method of alternately inverting and uprighting the child, with operative's thumbs pressing patient's chest from front. (6) *Buist's* method for children—in which a child is laid prone.

the tongue ; (b) wipe away froth from mouth. (c) Give free air, or oxygen. (d) Excite respiration by—ammonia near nostrils, tickling the larynx, electricity. (e) Do Tracheotomy (if required) followed by inflation of lungs with a pair of bellows.

III. **Establish circulation by—**(a) Application of *very* hot sponge or blister to praecordia, and flicking face and chest with wet (cold) towel. (b) Rubbing body from under a blanket. (c) Exhibiting stimulants (ether &c. hypodermically). (d) Even inverting patient, if necessary.

Modes of hanging [Under suicidal impulse, people use rope, leather, caravat, wearing apparel, even sacred thread].

I. *Jumping with a running "loose" noose* (Sub-aural or Sub-occipital) :—The noose slips up the thyroid and carries upwards and backwards the hyoid, and, with it, the root of tongue ; ∴, cavity of pharynx gets blocked ; hence, mark is directed obliquely *backwards* and *upwards*, to *mastoid* process.

II. *Jumping with a running, "tight" noose* (Sub-thyroid). The noose is in *front*, beneath the *pomum adami*. It flattens the windpipe against the spine and suffocation results.

III. *Jumping with a "knot" in a tight noose* (Sub-mental). Knot is in front, or to left, and rests against the chin. The rest of the ligature is lowest on the back of the neck, and thence passes obliquely *upwards* and *forwards* or to left side. Death results from pressure on the air-passages from the sides.

method for children—in which a child is laid prone and astride surgeon's out-stretched right forearm, whence it is thrown supine, over his left forearm. (7) *Schafer's* method (for the drowned) : Lay patient prone with something firm under his chest. With both palms, aided by your body-weight, squeeze lower ribs from behind, forwards and upwards ; then gently pull up patient, and so on. [A victim may be suffocated by aspirating into his lungs the contents of his stomach, during the use of this method].

IV. Judicial hanging.—The official knot in India and in England is the *sub-aural*, the victim dying instantly from fracture-dislocation of 2nd and 3rd cervical vertebrae. The drop allowed is proportionate to body-weight,—being 6'. 6" for 98 lbs. and 5 ft. for weights above 180 lb.

Post mortem appearances :

I. If seen soon after hanging, while body is fresh :

1. *Face*—is calm and pale.
2. *Eyes*—are not prominent.
3. *Tongue*—may not be protruded.
4. *Ligature mark*—is not ecchymosed.
5. *Lungs*—are not congested.
6. There is no evidence of *struggle*.

II. If body is not fresh : Same as those described on p. 61 with these special points :—

A.—Externally :

1. *Mouth*—is distorted.
2. *Conjunctivae* :—Cyanosis or ecchymoses of them are rare, except in full-blooded men, with noose on one side. *Eyelids*—are open and injected (if there was much violence.)
3. Marks of *streaks of saliva*—on front aspect of body.
4. *Arms*—stiff. *Fingers*—forcibly closed on the palm (if hanging has been sudden and attended with violence).

B.—The ligature mark on the neck. Its—

- (a) *Continuity*—never a complete circle.
- (b) *Situation* :—*high up on the neck*, e.g.,—(i) against chin ; or (ii) between hyoid and thyroid cartilages ; or (iii) just beneath *pomum adami*.

(c) *Direction* :—*oblique*,—(i) Upwards and backwards or to left mastoid process or occiput ; or (ii) Upwards and forwards to pomum adami or to chin.

(d) *Depth*—depends on (i) duration of hanging and (ii) on material used : If caused by—

- i. Soft, broadsilk or cloth—mark is indistinct. [There may be no mark, if body is immediately cut down].
- ii. Cloth twised rope-fashion—shallow, broad and smooth mark.
- iii. Rope (thin and hard)—the mark is a deep furrow (ridged or not), surface being not usually excoriated.

[Note the *pattern* as a possible aid to investigation].

(e) *Colour (free from ecchymosis)*—may be any of these, according to varied duration of hanging : (i) Normal colour ; (ii) Faint bluish colour ; (iii) Bottom of furrow, whitish ; its edges reddish ; with a violet blush beyond (specially above the furrow) ; (iv) Dry, Brownish, horny, parchment-like. [Blisters may be present above the constriction of the ligature].

(f) *On dissecting the mark*—

- i. Superficially :—tissues actually constricted are dry, condensed (\therefore pale), unecchymosed ; capillaries round them are congested (an antemortem phenomenon). [Minute subcutaneous extravasations are rare, unless, in full-blooded individuals].

ii. Deeply—

- (1) *Petechial hæmorrhages* about *sheaths of blood vessels*.
- (2) *Tunics of common carotid* are transversely ruptured—generally at point of its bifurcation. [This can be imitated by p. m. hanging].

- (3) Incomplete rupture of *muscles*—rarely found.
- (4) *Larynx* and *hyoid* bones—rarely injured.
- (5) *Cornua* of hyoid bone or thyroid cartilage—are broken often and the muscles and ligaments of the windpipe are stretched, bruised or torn.
- (6) Ecchymoses found about *spinal cord*. Separation of *vertebrae* (usually, a p. m. effect), and injury to *spinal cord*, are found in judicial and determined hanging. [Unless it is a case of homicidal hanging or of dropping from great height, these violent injuries are rare].

C.—Internally. (None characteristic).

1. *Wind pipe* :—Its mucous membrane is congested.
2. *Lungs* :—Occasionally, congested and cedematous. (Rupture of air cells and Tardieu's spots are usually rare).
3. *Blood*—is venous in its distribution. Right heart—full.
4. *Brain* is congested or not (according to state of lungs).
5. *Peritoneum*—is pink, if hanging has been prolonged.

Medico-legal points.

1. **Accidental** hanging, though rare, is possible.
2. **Suicide** is the *commonest* cause of hanging in adults, being rare only among children. A suicide, after trying in vain other means of killing himself (*e.g.*, cutting throat, shooting himself, taking irritant poisons &c.), may at last resort to hanging, and thus leave on his body, marks of suspicion-raising **ante mortem violence**. In suicidal hanging, the extremities may often be found twisted in a singular manner around articles of furniture. [Unless violence be of such severity as to cause *instant insensibility* or *absolutely contra-indicates self-infliction*,

presence of wounds and injuries of all grades of severity may be consistent with suicidal hanging.]

3. A man killed by poisoning or other means, may be **hanged post mortem**, to throw justice off its guard. Hence, in cases of hanging, always send viscera for *chemical examination*. Presence of irritant poisons in stomach points to suicide rather than to homicide.

4. **Single-handed homicide by hanging** of an adult requires super-human strength, unless victim be narcotised or asleep or a child or a helpless decrepit. *Such cases are recognized by* (a) signs of violence on the body generally, and on the neck particularly ; (b) by the absence of means whereby the victim could have raised himself ; (c) by character of knots, if any ; (d) by the ligature being low down on neck and horizontal ; (e) by the ligature being something not to be found in the possession of the deceased ; and (f) by circumstantial evidence—like door being barred from within, hands being tied behind.

5. **In investigating cases**, note (a) the *height* from the ground, (b) the distance of the body from the *nearest support*, (c) the length and nature of the *ligature* and the source from where it was obtained, (d) the way it was fastened, the nature of *knots* and their number and position, (e) presence or absence of *signs of struggle*, and (f) the condition of the *room*. [Remember that extremes of age, corporeal deformities and even blindness are no bar to *suicide* by hanging.]

6. **To establish death by hanging**, we must prove—(a) that the victim was *suspended by the neck alive* (partially or wholly) ; and (b) this act of suspension *caused* death. Such proof of death by suspension is of a negative character, being obtained by excluding other causes of *asphyxial* death.

7. **Ante-mortem hanging** is indicated, if these are present : —(a) *Turgescence* (not mere discolouration) of the vessels of

the head and neck. (b) Injection, cyanosis and swelling of base of tongue. (c) Signs of excitement of *genitals*. (d) Dribbling of *saliva* on front aspect of body. (e) Forcible closing of *fingers* on palms. (f) Petechiæ about *sheaths of blood vessels*. (g) Ecchymoses about *spinal chord*. (h) Congestion of capillaries about the *site of ligation*.

8. The mark of the ligature on the neck is a *cadaveric* phenomenon. It becomes more pronounced as time wears on. A ligature-mark found around the neck need not necessarily mean hanging or strangling ; it could have been produced by dragging a man alive or soon after death, or by the neck swelling against loosefitting strings or collars on neck. 'An ecchymosed mark, resembling that caused by ante-mortem hanging may be produced within three, and a non-ecchymosed mark within six, hours of death.' Unless the ligature produces p. m. appearances of violence to the tissues of the neck, or unless it is proved to have asphyxiated, the mark is of no moment. In exceptional cases of hanging, the ligature may be applied horizontally and low down on the neck (as in strangling). **Absence of mark** on neck in death by hanging or strangling, *may be due to* presence of (a) thick beard, (b) clothings on the neck, (c) ligature being very soft (d) early cutting down of body and (e) early inspection of the corpse.

9. As (a) the brain cannot stand interference with its blood-removal for more than 4 to 5 seconds, without seriously compromising its function, and as (b) a very slight compression of the wind-pipe speedily deprives the victim of consciousness and muscular power, it is not necessary for a ligature to completely encircle the neck. [The trachea is more easily flattened than the cricoid ; hence slight pressure over trachea or sudden and violent pressure over cricoid can **speedily stun** a man and render him helpless.]

10. Suicidal knot

vs.

Homicidal knot.

(a) *Single* or at most two.(a) Perhaps *multiple*.(b) *Granny* and badly or loosely tied.(b) *Reef* and firmly tied.(c) Situated in *front*.(c) Situated *behind*.(d) Absent, with *many turns* of the ligature.(d) *One turn* and firm knots

11. **Sequelæ of surviving hanging** : Convulsions, paralyses, severe mental aberrations.

C. STRANGULATION (GARROTTING).

(Thuggeeism)

Definition. Death by constriction of the neck, without suspension of the body, *the constricting force* being other than the weight of the victim's own body or his head [Constriction of neck may, thus, be effected by—(1) tightening a ligature on it or (2) pressing on it by foot, knee, wrist, bamboo etc., or even by (3) pressing neck by hand (= Throttling)]

Causes of Death.—Shock, asphyxia, apoplexy.

Symptoms.

I. *If the compression of wind-pipe (to the extent of flattening it) is sudden, violent and complete :*

1. Immediate insensibility (apoplexy), with
2. Total helplessness (inability even to cry or resist) ; and
3. Instantaneous death.

II. *If windpipe is incompletely closed —*

1. Deep cyanosis of face.
2. Clenched hands.
3. Convulsion (asphyxial).
4. Hæmorrhage from mouth, nostrils, throat, ears.
5. Rapid insensibility followed by death.

Treatment.—Same as in case of hanging, q. v. [The chances are better, if treatment is initiated within five minutes and the tissues of the neck are not injured badly].

Sequelæ of strangulation, if victim survives :—(1) Traumatic swelling of face, neck, upper chest. (2) Pulmonic and laryngeal troubles—pneumonia, dysphagia, abscesses. (3) Temporary loss of voice. (4) Sudden death from hæmorrhagic lesions of brain.

P. M. Appearances : I. Externally : Those of asphyxia generally (see p. 61) except for these special points (*which are signs of undue violence*) :—

1. *Eyes*—protruding, widely open. *Pupils* : dilated, bleeding rarely.

2. *Bloody froth* present in mouth and trachea. [*But there is no dribbling of saliva.*]

3. *Signs of general violence* : Injury to back, elbow, buttocks, heels etc. Clenched hands, containing hair or cloth torn from assailant.

II. The Ligature mark.

(a) *Deep*, usually wide, *complete*, *horizontal*, *low down* on the neck (usually, below thyroid). Behind, there may also be pressure-marks (of knot, hand etc).

(b) Its *surface* is livid, abraded or ecchymosed. [It does not become hard, brown, parchment-like.]

(c) On dissecting the mark—

(a) Extravasation of blood (subcutaneous) is present.

(b) *Muscles and Sheaths of Carotids*—are lacerated, with extravasations of blood and not mere petechiæ.

(c) *Thyroid, cricoid, trachea (even vertebrae)* : bruised, lacerated, fractured.

III.—Internally: As in all asphyxial deaths (see p. 61-63) save for these special points:—

1. Effusion of bloody serum into pericardium.
2. *Tardieu's spots*, are rare. [If they are well-defined, strangulation is contra-indicated.]
3. *Lungs*:—normal or injected; contain foam, hæmorrhages, patches of emphysema on surface. [The effusion of blood into lung-substance is visible only if autopsy is held early—or else lungs may appear even pale.
4. Brain and stomach—are occasionally congested.

Medico Legal Points.

1. To prove death from strangulation we *must* prove (a) that death was due to asphyxia, and (b) that it was due to *violent* compression of neck: *signs of undue violence on structures of neck are of greater importance than the position and nature of the ligature mark.* [But in *very* exceptional cases, an elastic or silken ligature may strangle one to death **without leaving superficial marks.** On the other hand, children and short-necked, stout individuals may *naturally* show on their neck, deep horizontal furrows. Therefore, do not pronounce strangulation if there is absence of signs of violence on the neck, or, if the body is decomposed, making examinations untrust-worthy, even if there be so-called ligature marks on neck and patches of ecchymoses, and if a ligature be forthcoming too.

2. Strangulation may be caused by **accidents**—in *babies* who may get strangled by their umbilical cord, in *drunkards* by various ways, or in *adults* by machinery accidents.

3. **Homicide** is the most frequent cause of strangulation. To substantiate it, look for (a) signs of general violence on the deceased person's body; and of *struggle*:—torn cloths or hairs in deceased person's hands; (b) means taken to *keep up the*

compressing force of the ligature after the supervention of insensibility ; (though sudden violent compression of neck brings on helplessness, it does not kill at once ; hence the necessity for keeping up the compressing force after the victim lost consciousness) ; (c) *other means than ligature* adopted to encompass death ; (d) *the character of the compression* : by foot &c., or by many turns of ligature (the *first* one being tight) or too many knots on a ligature. [Remember, that the absence of signs of struggle does not negative homicide.]

4. **Suicide**—usually by lunatics,—is indicated if the ligature (a) is found with a single, simple knot in front or on the sides (especially the left) ; or (b) has several turns, of which the *last* one is tight ; or (c) if, by means of sticks, passed through loops in the ligature, or by other means, the compression of the neck was kept up after they became unconscious. [Bodily infirmities are no bar to this form of suicide].

5. Marks of fatal strangling, when a victim has been dragged all the while, are difficult to differentiate from marks of hanging : they are incomplete, oblique, high up on the neck ; so are those of antemortem strangling and that caused immediately after death ; if in doubt, don't commit yourself.

6. *Always have viscera examined chemically, and examine the genitals to see if (in case of females) rape furnished a motive for strangling.*

7. **Signs of ante mortem Strangling.**— See p. 69.

(D) THROTTLING.

Definition. It is strangulation by application of fingers or hand to the throat,—*manual strangulation.*

Causes of death (1) Asphyxia (2) syncope.

P. M. Appearances—those of strangulation, except for—

1. **Marks on the neck** : *Tadpole-like marks* (surrounded by impressions of crescent-shaped finger-nails, with their convexity upwards) : one (thumb) on right side of neck, and 4 (fingers) obliquely outwards on the left. Thumb mark is always on higher level than those of the other fingers, and in case of a child, far towards the back. [If seen immediately after death, these marks are red and soft, with sero-sanguineous exudation ; if seen several hours later, they are—dry, hard, red-brown].

On Dissecting, these marks, are found—

- i. *Extravasation* of blood into tissues underneath.
- ii. Rupture of *muscle fibres* or *coats of arteries*.
- iii. Fracture of *thyroid* or *hyoid*—sometimes.

2. *Bruises* on the body generally, on lips, face, cheek, ears, etc., as result of struggle.

Medico-legal Points.

1. Always homicidal.

2. (a) If, executed scientifically, the p. m. appearances may be made to resemble those of sudden death from **epilepsy** viz, (a) suffused conjunctivae, (b) petechiæ on neck and shoulders, (c) tongue bitten, with (d) bloody foam in mouth and air passages, (e) oedema of lungs &c.

(b) On the other hand, “in case of *death from epilepsy*, the person attacked frequently grasps his own throat, so that, after death, marks of fingers may be found on the throat and a suspicion of murder be thus raised.”

3. **Finger-marks** may not be distinct *superficially*—(a) if a fold of thick cloth was interposed between the fingers and the neck, (but usually, on dissecting, evidence of finger-

impressions is found) ; or (*b*) the heel of the hand was used forcibly ; or, (*c*) if, in using too much force, the fingers slipped.

4. Violent blow on larynx is immediately fatal. Fractures of hyoid and laryngeal cartilages are also fatal. If the throat is suddenly and tightly gripped, the victim cannot cry and falls down quite helpless and may remain so for some hours or even die. This is not due purely to asphyxia.

5. In attempted throttling, besides local injuries, dysphagia, hoarseness of voice etc., follow.

(E) SUFFOCATION.

Definition.—Death from impediment to respiration, which does *not* act by *compressing* the wind pipe.

Classification of Causes :

I. — Accidental :

1. By food, drink or vomit—when affected with bulbar paralysis or diphtheria, or while drunk or narcotised or with pharynx cocainized or during general anæsthesia or epileptic fit.
2. By spasm of glottis—from breathing irrespirable gases,—(Cl , SO_2 , CO_2 , CO ,) or from swallowing irritant poisons or substances.
3. By round worms, false teeth, toys, excessive bronchial secretion —(in extremes of life).
4. '*Khalisa*' or '*koi*' fish jumping into the mouth and getting impacted in larynx. This happens during bath (in adults) or, in case of babes, lying unprotected where these fish are lying to be dressed up.
5. *Smothering*—(*a*) of newborn babe by clothes etc. while sucking its sleeping mother, or as result of teething convulsion ; or (*b*) of drunken people by their own clothes.

6. *Overlaying a baby* (below 9 years of age)—by its sleeping mother or cat or other domestic pets lying near.
7. Compression of chest—in a crowd, or by plaster of Paris while a cast of bust is being taken, or from collapse of huts or ditches.

II. Homicidal : By

1. Covering mouth and nostrils—by hand, wet cloth, resin plaster, soft pillows, &c.
2. Rolling—bamboo over chest (*bansdolla*), or placing heavy substance (like mill-stones) on chest.
3. Plugging the back of the throat—by pellets of cloth.
4. Filling mouth—with mud, bran, dust, ashes etc.

III, Suicidal (rare) :—By

1. 'Samadhi' (self-immolation) of lepers, by burying themselves up to the neck in sand (in expiation),
2. Stuffing air-passages or by forcibly closing them otherwise, as by forcibly leaning prone on bed-clothes.

P. M. Appearances : Those of (1) *asphyxia* : partial emphysema of lungs, whose surface is tuberculated, Tardieu's spots being often present ; (2) *signs of violence* : [If these are absent, do not give an opinion]. In cases of smothering or overlaying, there may be flattening of the nose, or one side of the face may be pale and flattened.

Medico-legal Points :—

1. An individual may die of suffocation *without there being any signs* of death by asphyxia. On the other hand, in a corpse that does not exhibit any signs of death by hanging, drowning &c., there may be signs of asphyxia not as indication of mode of death but as effect of disease or poisoning.

2. A man dying of *strychnine* poisoning, or of *tetanus* or *epilepsy* shows all signs of asphyxial death ; if in addition, injuries are present, it is likely that his death would be hastily ascribed to suffocation. The absence of blood-stained froth from mouth and nostrils will prognosticate against suffocation.

3. Broad horny marks on skin of chest, bilateral fracture of ribs &c. may be found in cases of *homicidal* compression of chest by bamboo &c.

4. 'It is constructive murder if a victim dies of suffocation from having inspired his or her vomit, provided that the vomiting was the result of rude violence and that the victim was no consenting party to the violent act'.

(F) DROWNING.

Definition : Death by asphyxia, in which, water (instead of air) is drawn into lungs,—the air passages or their orifices being obstructed by fluid medium.

Causes of Death (in order of rapidity) :—

1. *Shock*—from concussion of brain, fracture of spine (fall from a height into shallow water), fright on realizing his danger. Death is instantaneous.
2. *Asphyxia (pure)*—Death occurs within 2 to 5 minutes.
3. *Apoplexy*—Cerebral congestion.
4. *Syncope*—in cases of epileptics falling into water.

Mode of Drowning :—

(1) A man *sinks* into water the moment he falls, and he voluntarily and reflexly *holds his breath* ;—the depth fallen is proportionate to the impetus of fall.

(2) Then, if not stunned, he comes to the surface by struggling or *even* without any struggles, as his lungs contain air; while rising, reflex, *short, jerky inspirations* take place, during which he *sucks water into his air and alimentary passages*; this inspired water is churned up with the residual air into *elaborate froth*, and sets up irritation in the air-passages producing forcible expirations (cough) which cause sinking. Alternate coughing and jerky inspirations cause the body to alternately sink and float respectively for some time [If however, he is stunned after first submersion, he does not rise to the surface nor aspirate nor swallow any water but floats after death].

(4) Finally, *asphyxia*,—loss of consciousness, sighing inspiration at longer and longer intervals—and last of all, death, come on.

Treatment: [If *not actually dead*, persevere treatment even if body be stiff and cold, because, prolonged asphyxia can be survived at lower temperatures; even after $8\frac{1}{2}$ hours' persistence, patient has been revived]

(1) *Wipe froth away* from mouth; keep *tongue* pulled out. Place body head-downmost for a while.

(2) Free neck and chest of clothes; but do *not remove all* wet clothes until respiration is fully established.

(3) *Dry* the body and *warm* it up, when respiration has returned. Then, lay *prone*, with forehead resting on folded arms.

(4) Excite respiration by ammonia, snuff, aromatic vinegar to nostrils, along with artificial respiration, and galvanic current.

(5) Stimulate by—atropine gr. $\frac{1}{8}$, 'adrenalin' m. 5, 'pituitrin' [Prevent death from inflammation of lungs.]

Signs of revival:—"Slight *flushing* and convulsive *twitching* of the face, returning *warmth* of the skin, *gasping* and *sobbing*

breathing and *movements* of the body and limbs are signs indicating speedy recovery." *Do not be too sure, as, after resuscitation, patients have speedily taken a turn for the worse and died.*

Post mortem appearances : [Depend on (a) the *stage* during which death takes place and (b) the *time* when the examination is held. Always hold the p. m. as soon as possible after the body is taken out of water. Remember that *there is no characteristic sign of drowning : a man may die of drowning without any characteristic p. m. signs.*]

A. In body before floatation (*i.e.*, before putrefaction.)

External :

1. Body is very *cold, wet* muddy and *rigid*. [Body would be warm, if found in warm water].

2. Colour of body generally is (a) *normal* or (b) *paler* or (c) *livid discolourations* may have appeared here and there. [They appear first on face, neck or upper part of sternum.]

3. *Face* is pale and calm. *Lower jaw* is stiff.

4. *Eyes* are not open or only half open. *Ecchymosis of conjunctivæ* is rarely found.

5. *Elaborate froth about mouth and nostrils*. It is found in *slow* deaths from asphyxia, also in epileptic death and, is absent, if body did not rise after first submersion. [It disappears within 12 hours, or, if the body is far decomposed.]

6. Phenomena of instantaneous R. M. :— (a) *Cutis anserina*. [Note the part of body where it is found.] (b) *Contraction of penis* (sometimes, *semi-erection of it*), of *scrotum*, and of *breast-nipples* is also found. [This last is absent, if water is not cold.] (c) *Mud, weed* etc. are found grasped by the clenched hand.

7. *Cuticle of the tips of fingers and toes and of palms and soles*—soddened and greyish (dhobie's hand) or blue in colour ("cholera hand") and can be pulled off like gloves. Mud and aquatic or land plants may be found under nails. [These are not present in bodies taken out of water within half an hour or so. The soddening etc. may also be a p. m. phenomenon.]

Internal :

1. *Blood*,—dark and fluid and does not coagulate easily. [Water is absorbed into blood from lungs and stomach]. *Venous distribution of blood*—right side of heart is full, left empty. [If body has remained in water for a long time ; or, if death has not taken place from asphyxia, these will *not* be the appearances of the lung and heart (see below).]

2. *Trachea, bronchi and air-vesicles*—congested and full of watery-mucoid-bloody froth or food matter, weeds and mud.

3. *Lungs are "ballooned"*—congested, doughy (with in-drawn water), inelastic (pit on pressure) and cover heart to an abnormal extent. [Although a piece of such lung floats, it is 4 to 5 times heavier than ordinary lung. On incising into it, bloody frothy fluid escapes]. If struggle during life has been great, Tardieu's spots are found.

4. *Stomach and small intestines* (upper part)—may contain mud, weeds and a large quantity of water. [Microscopically examine the water to identify its source].

5. *Brain*.—Hypercemia is rare ; but, hypostasis is not infrequently mistaken for it.

B. In very putrid bodies :

External : Those of putrefaction generally, (pp. 27 *et seq.*) with most signs of drowning, detailed above, altered or lost.

Internal :

1. *Lungs*—are dryish ; or, look congested and softened.

2. *Pleural cavity*—may contain plenty of stained fluid.
3. *Heart*: Right side contains gas and very little putrid blood, *endocardium* being stained red. Left heart is empty and unstained. *Blood* is decomposed and dark.
4. *Stomach*—may be empty.
5. *Intestines*—may contain mud, but no fluid.
6. *Brain*—may look congested (hypostasis).

Medico legal Points.

1. **Absence of p. m. signs** in cases of drowning, is due to death from (1) *shock* from fright of the impending danger, or from coming in contact with the cold water; (2) the *fall*; (3) victim having *previously become insensible*; or (4) having previously been *dying* or *moribund* from the effects of—poisoning, epilepsy or apoplexy. *In all cases, examine viscera for poisons or disease.*

2. Length of time required for—

Asphyxiation=2 minutes at most	} ∴ To be dead
Heart to stop=3 to 5 „ „ „		=5 to 7 minutes.

3. **Prognosis in asphyxia.**—If a body is not brought up within 5 minutes of *complete* drowning, recovery is doubtful. After entire cessation of respiration, continuance of heart beats is no test of the power of recovery. But asphyxiation is not synchronous with death, and recovery is “in inverse proportion (a) to the amount of mucous froth present in the air tubes and (b) to the penetration of lung substance with water,” (c) being favoured by the presence of syncope.

4. **The longest recorded stay under water** is as follows :—
 Sponge-divers—76 seconds; Arab divers of Red Sea—75 seconds; Ceylon pearl divers—50 seconds. It is seldom more

than 2 minutes—though only Miss Wallenda at the Alhambra Music Hall stayed 4 minutes and 45½ seconds. *Ordinarily*, a man can hold his breath for 30 seconds voluntarily.

5. **Drowning is Suicidal**, if—(a) Body is *naked* or (b) has *weights attached* to it. [Hindu females, on the contrary, arrange cloth carefully, drawing it tightly between legs and fastening it firmly there and at waist.] (c) *Poisons* or *injuries*, (self-inflicted or received by the fall) are also found, and (e) *hands* or *feet* are *tied* in such a way as could have been easily done by the individual himself. [Suicide in shallow water, is *perfectly consistent* with adult age and full possession of senses.]

6. **Drowning is Homicidal**, if—(a) *Face* was immersed in *shallow water*,—in case of an adult, with much force, and in helpless persons or children, without much force. Whole body need not necessarily be drowned to cause death. (b) *Land-plants* are firmly held in hands of victim. (c) *Arms* are *tied* in such a way as could not have been done by deceased himself. [Note—the material of which the ligature is made, its tightness, position and nature of knots, also if any stains are present on it.] (d) *Weights* are attached to body, to keep it drowned. (e) *Marks of ante mortem violence*, peculiar or severe in nature, are present. [Exclude such as can be caused by fall, fish bite, or impinging against hard obstacles by strong current.]

7. **Drowning is Accidental**, (in swimmers, from cramp of muscles; in epileptics, drunkards, insanes etc.) if—(a) *Land-plants* or mud are held in hand. (b) Body is found in *shallow water*, and the individual was helpless (being a child, or drunk.) (c) Signs of *injury* (due to fall) are present—*antemortem* or *postmortem*.

8. **Floatation** occurs (a) *in fresh water* (i) in hot weather—within 24 hours (ii) in cold weather—in 1 to 3 days. (b) *In deep sea-water*—on 8th or 9th day.

9. **Floatation (= putrefaction) is governed by—**

(a) *Conditions of the body or of the water that help putrefaction*: In dirty water of tanks, partially drowned bodies, fat bodies, bodies of women or of persons dead of septic diseases float sooner than completely drowned, lean men's bodies, dead of acute non-microbic diseases, in clear running waters. [A completely submerged body may remain undestroyed for over 18 months.]

(b) *Sp. gr. of the fluid*: Sp. gr. of human body is 1.008; of fresh water is 1.003; of salt water 1.005 ∴ a body floats sooner in salt, than in fresh, water.

(c) *Weather* (temperature, humidity)—In summer, a body floats earlier.

10. **Buoyancy of living body**—depends on (1) *Its adiposity*: hence, women and children float easier (2) *Lightness of bones* as in females. (3) *Large chest-capacity*:—hence, deep inspiration buoys up, while screaming causes expiration and drowns. (4) *Dress* being capacious and enclosing some air. (5) *Quietness*.—During struggles, every part of body raised above water-surface acts as it were as an additional weight and helps drowning; hence, only a quiet man floats.

11. **Signs of being drowned alive**:—Presence, collectively, of—(a) *cutis anserina*, (b) *retracted or erected penis*, (c) *cadaveric spasm* (d) *sand, mud, weed etc. in grasp*, or under finger-nails (e) *water in stomach* containing mud, aquatic plants etc, (f) *muddy water inside air-passages*, (g) *subpleural ecchymoses*, congestion of lungs, (h) *froth* in air passages.

12. **Probable time of Drowning**—very unsafe to fix. (a) *If body is fresh and cuticle of finger-tips and toe-tips is soddened=*

at least one hour's drowning; (b) If *not* soddened = perhaps half an hour's; (3) If *whole palmar surface*, backs of elbows and knees are soddened = at least 10 or 12 hours' immersion.

13. **Sexual variations in floatation.**—*Female* bodies float with abdomen uppermost; *Male* bodies float with back and buttocks uppermost.

14. **Marks of violence.**—In a corpse long under water, ante-mortem marks of violence are not apparent until most of the imbibed water has evaporated. On the other hand, in an otherwise uninjured body, floating on water, injuries may be due to—(a) *Antemortem causes*, owing to (i) suicide in rough, narrow places, or (ii) homicidal violence. [Inspect the spot]. (b) *Postmortem causes*, e.g., (i) rough handling while fishing body out of water; (ii) body whirling through eddies or knocking against rocks &c.; (iii) fish, mollusc, rat or turtle-bites. [Such wounds are—(i) Sharp edged or eroded; (ii) Crescent shaped, with impressions of teeth, in some cases; (iii) Show no signs of vital reaction.]

15. **Artificial respiration** has been *successful* after even 8½ hours' suspended animation. Hence, persevere, even if patient be cold and stiff. **Death after resuscitation** may be brought about by—septic phenomena (from entrance of dirty water into air cells), rupture of aneurysm, fatal cardiac distress &c.

16. **Watches on the person of the drowned**, stop within a few seconds of submergence, rare ones going on for a quarter of an hour at the outside.

CHAPTER V.

(A) DEATH FROM BURN.

Definition & Source.—*'Burn* is an injury caused by the application of (a) a flame or (b) a substance heated much

above the temperature of boiling water.' 'Scald' is produced by liquids at or near boiling point. *Chemical destruction* of tissues is medico-legally, a species of burn.

Prognosis depends on : (1) *Extent* of burn : Injuries of $\frac{1}{3}$ to $\frac{2}{3}$ of body-surface, however superficial, are fatal. But, as, relatively to its weight, a child has a larger skin-surface than an adult, involvement of $\frac{1}{5}$ th of surface-area is fatal to children. (2) *Situation*.—Those over serous cavities (head, chest, abdomen) are particularly dangerous. (3) *Duration of exposure*.—The longer it is, the worse. (4) *The temperature to which the body has been exposed*.—The higher it is, the worse. (5) *Age* of the individual.—Bad, at the extremes of life, specially in case of children. (6) *Sepsis*.—Its presence is bad. But children stand prolonged suppuration better than do old men.

Treatment.—

(1) **Warm up**—by hot bottles or blankets or cotton wool.

(2) **Counteract shock**—by ether, alcohol, strychnine or other cardiac stimulants, subcutaneous or intravenous injection of hot normal saline solution (up to 7 pints in 24 hours).

(3) **Ease pain**—by administration of opiates (if an adult).

(4) **Locally**—(if necessary, but very cautiously, under chloroform)—(a) *Secure thorough asepsis*—with boric lotion or lysol (1 : 100) or tinct. iodi, washing off the excess of antiseptics by saline solution ; cut blisters and remove dead epithelia (as, pyogenic bacteria may be found in bullae). (b) *Dress* with dry, sterile gauze or gauze wrung out of—boric lotion, or aqueous solution of ichthyol (30%), or of thiol (1 : 4), or out of this mixture : picric acid, 45 gr. + absolute alcohol 1½ oz. + aq. destil. add upto one pint ; or swab with benzine ; or, dust over with bismuth subnitrate + thiol, or

novo-iodine ; or cover with dry sterile gauze. [Boric ointment, carron oil, carbolic or other oils, collodion, dry powders, alcohol-sponging—are better avoided]. Remove dressings in a warm bath, next day. (b) *Ease pain* by dusting anæsthesin or bandages or splints. (c) Do *skin-grafting* when necessary.

Danger of death from burn :

1. **Immediately**—from *shock*, or *suffocation (asphyxia)* from inhaling smoke (CO or CO₂ poisoning).

2. **Within 24 hours**—from *shock* or *collapse* from pain or injuries ; or from *coma*—owing to congestion running on to effusion into ventricles of brain.

3. **Within one to six days**—from effects of *acute toxæmia* (albuminuria, diarrhoea, meningitis, pneumonia &c.) or from oedema of glottis, pneumonia, bronchitis etc.

4. **Subsequent to that period**—from *exhaustion*, from suppuration, (almost inevitable) sepsis, gangrene, secondary hæmorrhage, lardaceous diseases, ulcer of duodenum, tetanus, erysepelas, etc. [*Inflammation of deep-seated viscera appears after several days. Hence give guarded prognosis*].

[*The first week is the most dangerous period.*]

Classification into Degrees (Dupuytren's) :—

1. **Simple Erythema** (redness).—*Caused by* (a) heat much below boiling point, (b) mild chemical irritants, (c) prolonged exposure to sun (d) momentary contact of flame. [The parts may be slightly swollen and the tissues juicier, and after slight inflammation, the superficial layer of skin peels off. *No tissue destruction occurs* ∴ *no scars* are left. *It disappears* (a) spontaneously, in life, after a few hours ; or, (b) after death, as the effect of gravitation.

2. **Vesication**—*caused by* momentary application of flame, or fluids at boiling-point or hot solids (above 100°C) or of strong irritants (cantharides, antim. tart. etc.) Skin is blackened, hair is singed, superficial layers of epithelium are destroyed. *No scar* is left, but, perhaps, a slight *depression*, and some *staining of skin* may remain. [Suppuration occurs in unhealthy subjects]. [In ill-nourished individuals, blebs may form without the application of heat; blebs may also form spontaneously over areas inflamed from other causes than burn.]

3. **Destruction of cuticle and parts of true skin.**—*Caused by*—prolonged application of flames or of fluids above 100°C or of hot metals (the shape of the last-named can be often inferred from the shape of the wound). A *scar* results, but *no contraction*. *It is the most painful stage of burn.*

4. **Total destruction of true skin and subcutaneous tissues.** The eschar which forms, falls off between 4th and 6th days. Extensive *contraction (scar)* and *deformity* result. If seen at once, fragments of clothes may be found, and vessels are distended full of coagulated blood. This is *not very painful* owing to destruction of sensory nerves.

5. **Penetration of the deep fascia** and implication of the upper layers of muscles by formation of an eschar. Great *scarring* and *deformity* follow.

6. **Charring of the whole limb down to bone.**—If the individual survives, look for signs of inflammatory reaction.

Results of burn—may be *Grievous Hurt* [I. P. C. § 320]:—

(1) Patient may be *confined to bed* for over three weeks, in pain. There may also occur (2) Permanent *disfigurement* of head or face; (3) *Loss of sight* of one or both eyes; (4) Permanent *loss of use of a limb*.

P. M. appearances [*Note sex, identity*]:

(A) Of Rescued dead bodies :

1. *Body*—is swollen, blistered and charred black.
2. *Skin* of body generally—is ruptured in many places, through which fat is protruding, and *hair* around which is singed. [Burnt tissues crack on moving].
3. *Skin at the flexures*—shows incised-looking *cracks*—the margins of which are irregular and connected by bridges of arteries, tendons etc.
4. *Skull*—is burst or fractured.
5. *Brain* and *lungs*—are shrunken.
6. *Blood*—is coagulated and cherry red, showing spectrum of CO-hæmoglobin.
7. *Larynx*—is injected.
8. Soot, fragments of paper and froth are found in larynx.
9. *Testicles* and *uterus*—resist burning for a long time.

(B) Of Persons who have survived some time :—

1. Signs of *inflammatory reaction at sites of burn*.
2. *Inflammatory lesions* of (a) meninges and serous coverings (with effusion thereinto) ; (b) of air-passages and lungs, brain, liver and kidneys ; (c) of alimentary canal (specially of oesophagus, duodenum, ileum) ; Curling's duodenal ulcer (specially in children), inflammation or ulceration of Brunner's glands, Payer's patches and solitary follicles. [In rapidly fatal cases, *the abdominal viscera* are comparatively anæmic and in less severe cases, hyperæmic.]
3. *Blood*.—Specific gravity and polymorphonuclear leucocytes are increased ; thrombi are noticed.

Antemortem burn : characteristics = 3, viz.,

1. **Redness** along the edge of the burn (as a *boundary*) and as a *base*. This extends to subcutaneous tissues, and, hence, *does not fade on pressure* ; openings of sweat and sebaceous glands become prominent. [(a) *Simple erythema* disappears soon after death, and, on pressure, during life ; (b) but,

this non-fading redness cannot be produced 10 minutes post mortem. (c) *In post mortem burns*, the surface and substance of true skin are white and openings of gland-ducts are grey.]

2. **Blister** (*when present*) contains *clots* or *serum* rich in albumin and chlorides; its *base* and *boundaries* are *red*. [(a) *Intense inflammation*, caused by disease or the application of irritants, friction, pressure or strong stimulants, produces similar blisters with similar base and boundary. (b) A blister containing serum, but without red base, can be raised at any time *after death*, in dropsical bodies. (c) *Blisters of putrefaction* are situated on parts that are colourless or green (d) *Within 10 minutes of death*, if a blister be raised, it contains gas and water-vapour, and its margin is not red.]

3. **Signs of inflammation** (pus, granulations etc.)

Medico-legal points.

1. **Is burn the cause of death?**—*There are no sure characteristics of death from burn*, save (a) the state of blood (b) the duodenal ulcer, when present, and (c) presence of a large amount of calcium phosphate in the ashes of a burnt place (animal remains). *Burnt bones* may retain their form. Exclude death from *poisoning* or *other causes* (injuries &c) and look for characteristics of ante mortem burning.

2. **Spontaneous or Preternatural Combustion** of the body is a figment set up when persons, murdered by some other means, are burnt, to avoid detection. True, it is mentioned by old writers of repute: and, in the process of putrefaction (and rarely, even in life), inflammable gases form in the body; but old writers were not careful observers; and beyond the inflammable gases themselves, the whole body cannot burn.

[Coal containing iron pyrites; damp cotton, cocoanut fibre, esparto grass, flax or hay; hydrogen phosphide; iron in fine state of

division ; linseed or other drying oils mixed with cotton, flax, hemp, woody fibre or wool ; marsh gas, phosphorus (in atmospheric air or chlorine gas), paper soaked in turpentine ; red fire ($=S+C+Sb_2S_3+KClO_3+SrNO_3$) ; silicon hydride ; water+sodium (metallic), turpentine+fuming nitric acid, zinc ethyl—are some of the substances that spontaneously combust].

3. Burns are, as a rule, **accidental**, specially in persons who are *drunk* or *narcotized* or *too young*. **Self-inflicted** burns (or chemical cauterizations) are produced to support a false charge ; they are usually *slight*, more or less *parallel* or *symmetrical*, situated on *accessible* and chiefly upper parts of body, and *many* in number. [Plunging arm into very hot fluid is a form of *ordeal* and *actual cautery*, *moxas* and *blistering* are common modes of indigenous treatment.] **Suicide** by burn is not uncommon among *hysterical* women or in a fit of temporary *insanity*, or as an act of *religious* bigotry. **Homicidal** burns are *multiple*, on different, perhaps *inaccessible* or *private*, parts of the body and attended with other vital injuries. [Injuries may be the result of accident, homicide or self-infliction and incised looking wounds at flexures are result of cracks due to burn.]

4. **Chemical irritants** do not raise blisters or singe the hair nor go deeper than true skin. They stain clothes and the skin. [See under "Corrosive Poisons.].

5. **Burns caused by electricity** (a) may be superficial or deep ; (b) are usually *painful* ; (c) are *not* attended with *fever* ; (d) do *not suppurate* ; and (e) *cicatrise* quickly and well.

6. The administration (by mouth or as dusting powder) of **opiates** in cases of burn, specially in cases of children, is not correct, as precipitating and aggravating the coma that follows burns. **Carbolic** and **picric acids** should be cautiously used too.

7. **Effects of different kinds of burn** :—*Radiant heat* whitens the skin. *Ordinary flame* scorches and causes des-

truction of substance ; *flame of Petroleum* blackens and leaves odour of itself ; *flame of an Explosive* scorches, mummifies and darkens skin and unoxidized particles of it are impacted into the skin. *Boiling water* vesicates and soddens the tissues, which look stippled, leaving hairs in tact ; *boiling Oils* or *molten Metals* act like heated solids. *Superheated steam* renders skin inelastic and sodden. *Heated Solid body* dries and blackens skin and destroys and chars tissues. *Exposure to very great heat* makes body rigid in an attitude of defence—so-called “pugilistic attitude.” *If skin is moist*, it is possible for skin not to be burnt by short contact with heated solids or fluids.

8. If, before or after full development of **rigor mortis**, a dead body is subjected to temperature over 73° C, but short of causing disintegration, a *higher degree* of rigor mortis than natural may be produced.

9. **Time question in Burns** :—The *time when a burn was inflicted* cannot be fixed positively, as the stages of inflammation are notoriously variable. (a) A very strong and active flame may, in half an hour, destroy a body very considerably. A smouldering fire effects but little, even in hours. In crematorium, at a temperature of 1800° F, confined bodies burn in $1\frac{1}{2}$ hours. In Indian burning grounds, under active and large flame, bodies take $2\frac{1}{2}$ to 4 hours to be completely burnt.

(B) DEATH FROM HEAT-STROKE.

Synonyms : Heat Apoplexy, Heat Exhaustion, Sun Stroke, Insolation, Thermic Fever, Siriasis, Coup de Soleil, Coup de chateur, Ictus solis, Calenture.

Sources of heat (to give rise to heat-stroke).—

1. Direct exposure to *the sun*. [Glare intensifies the deleteriousness of radiant heat. The actinic, rather than the heat, rays are our enemy].

2. From *prolonged* stay in *heated* rooms, where the *atmosphere is still* and *moist*, the soil is low, alluvial or near river.

Factors predisposing to heat-stroke in an individual are :

(1) Exhaustion (2) Alcoholic excesses (3) Previous attacks of heat-stroke (4) Unaccustomed to high temperatures.

Clinical Varieties :

I. **Heat Exhaustion or shock** : [*Cardiac* variety, resembling vagal inhibition.] *Caused by*—prolonged exposure to high temperature + physical exhaustion. *Symptoms* : nausea, vertigo, restlessness, delirium, sudden unconsciousness, extreme prostration, heart failure, vasomotor paralysis, collapse, death resulting from dyspnoea. *Prognosis* : (a) slow recovery or (b) onset of thermic fever or (c) death. *Treatment* :—Remove patient to coolest and shadiest place. Recumbent posture, head being low. Loosen all constrictions of dress. Give ammonia to nostrils, mustard plaster to præcordium, hot bath, if temperature be subnormal and internally ether or brandy. *P. M. Signs*.—Those of death from syncope.

II. **Thermic Fever**. [*Cerebro-spinal* variety. This is "Sun Stroke" proper.] *Causes* : Intemperance + high external temperature. *Onset* with shock—or without prodromata of nervous depression, even while one is in shelter, at night, or dizziness, nausea, vomiting, aural or visual illusions, diarrhoea, frequent micturition. *Symptoms* (i) In asphyxial form—Sudden heart-failure, dyspnoea, coma ending in death. (ii) In apoplectic form : Flushed face, pungent skin (temp. 107° to 110° F), convulsions or unconsciousness ; respiration—laboured, deep, even stertorous or of cheyne-stokes type ; sphincters relaxed, urine scanty and albuminous. *Fatal*—within 24 to 36 hours. *progress* when recovery occurs, is very rapid. *Relapses* are common after recovery.

Treatment: *In asphyxial type*—Free bleeding.—*In apoplectic type*: Ice bath, pack or douche or ice water enemata, till temperature comes down 4° or 5° F. In urgent cases, give turpentine enema and do venesection. Avoid antipyretics—except quinine.

After-effects when recovered: (1) Permanent inability to bear temperature higher than 80° F in the shade. (2) Loss of power of mental concentration (3) Failure of memory. (4) Intolerance of alcohol (5) Easily-induced mental and physical fatigue (6) Intellectual or emotional insanity, epilepsy, incurable headache or other permanent nervous disabilities.

Post Mortem Signs

(A) In Thermic Fever.

1. *Body-heat* persists long and there is post mortem rise of temperature.

2. *Blood* is fluid and clots imperfectly; sùggilation occurs in dependent parts of skin and serous membrane.

3. *R. M.* is early but evanescent. 4. *Putrefaction* rapid.

5. Intense congestion of *viscera*, especially of lungs; venous engorgement of brain.

6. Arterial system empty, veins distended; left side of heart is contracted, right dilated.

(B) In Heat Exhaustion:—Those of syncope, *q. v.* p. 14.

Medico-legal points:

1. **Very high temperature can be borne without injury, if** (a) the air be *dry*, (b) *air is not fouled* by overcrowding, (c) the exposure to it be *short*, (d) the individual be *not stout or full-blooded*, (e) the *heat and humidity* of the weather be *not high*, (f) the *excretory organs* of the individual be *healthy*, (g) there be *no history of alcoholic indulgence* previously.

2. **Endurance of heat and cold** is a matter of habit. American seamen work in a temperature of 160°F or more. Workmen have entered ovens at 340°F and Chabert entered ovens at between 400° — 600°F . In Turkish baths, temperature has often been raised to 250°F and in some cases, with fatal results. Life is compatible also at -157°F . In either case of extreme increase or decrease, the body-temperature does not fluctuate much.

3. *A man may be burnt alive while asleep*, without waking, if the temperature be very gradually raised.

(C) ELECTRICITY AND LIGHTNING-STROKE.

Introduction :—

1. **THE HUMAN BODY** is a worse conductor than copper wire of sufficient thickness ; but it is a better conductor than a tree. Hence, a man is liable to be struck, if he stands under a tree or near wires of insufficient thickness. The skin is the most resistant of human tissues.

2. **MODIFYING CIRCUMSTANCES :** (1) *Different persons* are differently vulnerable. (2) *Fright* or *sudden physical surprise* acts detrimentally. (3) *Weak intellect, chloroform anaesthesia* and *sleep* lessen vulnerability. (4) Current of a fraction of *ampere* may be fatal but not so are larger currents of several amperes. Low *voltage* is fatal if the patient's skin and clothes are wet and he makes a good contact ; very high voltage is less dangerous.

3. Rapidly *alternating* currents, being of greater tension, are most fatal ; so is the *opening* current of an induction coil. [A pressure of 225 Volts has proved fatal]. Ordinarily, 2000 Volts or 100 milliamperes are fatal. *Return shocks* (i.e., shock from discharge of electricity induced in a person's body by an electrically surcharged cloud discharging its own electricity) are also fatal.

Symptoms.

I. **If current is of slight intensity** :—Tingling, pain and numbness (*galvanic*) ; sudden, severe contraction of muscles (*faradic*).

II. **Severe non-fatal current** :—The person raises a sharp cry, and he may get any one or more of these symptoms :—

1. *Vomiting* ; *breathing*,—deep, slow, interrupted. *Pulse*—slow. *Pupils*—dilated (as in concussion of brain).

2. A tremendous *pressure-sensation* across the chest ; severe *shock*, which may be followed by paralysis, long-drawn-out delirium, convulsions, collapse or death.

3. *Unconsciousness* with convulsions—ending in death or slow recovery.

4. Severe *injuries*—burns, blisters, punctured wounds, lacerations, fractures, fissures, red streaks or tree-like echymosed markings on body (“arborisations.”)

5. *Mental shock*, followed by severe neurasthenia—insanity or mental aberrations, paraesthesias, or paralysis of general nerves of motion and sensation, fear, hallucinations, disordered or lost vision, dumbness (paralysis of muscles of glottis), noises in the ears, deafness, loss of memory, etc.

III. **Fatal current : Lightning**—*Instantaneous death* with or without marks of *severe injuries* (lacerations, fractures etc.)—and tree-like markings.

Causes of Death :

I. **Immediately**—from (1) *Heart failure*—owing to irremediable fibrillation of the Ventricles of the heart. [Left Ventricle is contracted and empty ; right Ventricle and auricle are full of blood.] (2) *Asphyxia*—from respiratory failure or prolonged tetanus of muscles.

II. **Very soon afterwards** from—(1) *hæmorrhage* in or around brain, lungs, pericardium ; (2) *concussion* or other shocks to central nervous system ; (3) effects of *burn, thrombosis &c.*

Treatment.—(1) AT ONCE—*Artificial respiration* (Schafer's method) with rhythmical traction on tongue ; (2) *venesection* and arterial injection of salt solution ; (3) *stimulants* (adrenalin &c.) ; (4) *warmth*. (5) *Massage heart* if necessary. (6) *Absolute rest*—never allow patient to move for some hours.

Post mortem Appearances [*There may be none*]

1. *Body* is flexed in the attitude in which it was struck.
2. *Blood* is fluid. *R. M.* and *Decomposition* are hastened.
3. (a) Signs of *burn*. (b) *Arborescent markings* (caused by track of current) on skin. (c) *Hæmorrhages* from parts of the body. (d) *Fractures* of bones. (e) Bursting of skull and injury to brain and its meninges. (f) *Clothes* burnt, ripped up, or torn into shreds and scattered to distant parts.
4. *Metallic things* melted ; *steel articles* magnetised.

Sequelæ, when patient survives :

- (1) *Bulbo-spinal* or *local* pareses. (2) Feebleness of *intellect*
- (3) *Sensory* disturbances—loss of sight or sensation (4) *Hyper-sensitiveness to electricity*. (5) *Gangrene, suppuration*.

Medico-legal Points.

1. **Recognition** by a lightning flash, see p. 58.
2. **Effects of Lightning** :—(a) If a fatal current is *completely conducted* through the body, no injury occurs to the body ; similarly, in cases of persons dead of return-shock. (b) But, if current exceeds certain pitch of intensity, it "*disrupts*,"—its course over the body-surface being represented by the *arbor vitæ* and ruptures of tissues. [But if the *clothes* are extensively injured, not much injury to *body* is likely].
3. As the result of lightning stroke, '*blind*' men have been known to recover sight, the *deaf*, their power of hearing and women, their *sexual* functions.

(D) DEATH FROM EXPOSURE TO COLD.

Symptoms.—(1) *Chilliness*, lowered *temperature*; feeble, slow *pulse*

(2) *Congestion of all internal organs*—*Spleen, Liver, Lungs, Nervous centres* (hence—torpor, somnolency, giddiness, dimness of sight, delirium, tetanus, paralysis) and of *Sexual organs* (hence, priapism &c).

(3) *Locally*, erythema, chilblain, frost bite, death of the part (chiefly, tips of fingers, toes, ears, nose etc).

Treatment. Rub vigorously with *ice*; then *gradually* increase temperature, apply blankets and *stimulants*. Never apply heat all at once, but do so *very* cautiously and gradually.

P. M. appearances. [*Nothing characteristic*]. If seen immediately :

1. *General pallor* of body, with *cherry—red patches* on exposed, non-dependent parts. Body is *undecomposed*.

2. *Blood* is of *cherry-red* colour. [Examine spectroscopically for CO-haemoglobin.]

3. *Heart* (both chambers)—full of deep-coloured blood. There is congestion of *larger artery* and *vein of chest*, and *anæmia* of organs that are usually largely supplied with blood.

Medico-legal points.

1. Most cases of death from exposure to cold are **accidental**. Children are **homicidally** disposed of, by exposing them to cold or by chilling their skin with cold liquids. [*Sudden, cold bath* or *ingestion* of cold water, while one is very hot, may lead to sudden death.] [Instances are on record of men surviving blood-heat at 75° F for some time.]

2. **Modifying Circumstances** :—(a) *Female sex, extremes of age, exhausting conditions* like—drunkenness, previous ill-health, starvation, shock to nervous system (*e.g.*, after attempts at rape or violent assaults); or (b) *prolonged exposure, active*

wind and *wetted* state of skin *accelerate death*, when one is exposed to cold.

3. **Proof of death from cold** is derived more from circumstantial, than medical, evidence. A body found frozen (during uninterrupted frost) is likely to have been dead from cold ; but presence of *decomposition* in a frozen body (provided, frost has been uninterrupted) points to death by other means, and of *necrotic lesions of skin*, to their ante-mortem origin. The p. m. appearances are ill-marked in *children's* bodies. The *florid colour of blood* cannot be produced post mortem even by prolonged exposure to cold. Presence of *dark-coloured blood in heart* is quite consistent with death from cold.

CHAPTER VI.

DEATH FROM STARVATION.

Causes :

1. **Homicidal** : In the cases of :—(a) *Insanes*, of whom their relatives are tired or ashamed ; (b) *Infants, children* or *adult* heirs to estates, whose guardians are ashamed, tired or jealous, or, on whose lives people trade (“baby farmers”) [When, in these cases, adequate food is given, weight is rapidly gained].

2. **Accidental** :—during *famines, shipwrecks, mining accidents*, stricture of *œsophagus*, or any other *organic disease of gastro-intestinal tract*.

3. **Suicidal** :—(a) *By lepers*—who, hoping for cure or spiritual uplift, bury themselves up to the neck in sand (‘*śamādhi*’) (b) *By long-term criminals* or *lunatics*. (c) *By hysterical girls*, who take to supernatural fastings.

Classification :—(1) **Acute**=*sudden, total* deprivation of food : death within 14 days. (2) **Chronic**=*gradual, relative* deprivation of food, extending to the extreme limit of 2 months.

Symptoms :

1. *Hunger*,—which is most acute within 24 hours,—tends to disappear between 36—48 hours. [*Pains* and discomfort in *stomach*, at first relieved by pressure, gradually become so intense as to cause, in rare instances, delirium or violent excitement].

2. *Pulse* is at first quick, then slow, again quicker towards the end.

3. *Body-weight* is lost rapidly. *Fat*—disappears (\therefore *bones* stand out and *look* is weird). *Muscles* waste.

4. *Temperature*,—after a preliminary rise, falls to sub-normal. There is complete prostration of *strength* and weakening of *bodily functions* ; hence, feeling of *cold* all over the body.

5. *Tongue* is dry, dirtily coated. Mouth is dry ; saliva is scanty and thick : \therefore insatiable *thirst*. *Breath*—is foul and hot.

6. *Gums* spongy, with tendency to ulceration. *Mucous membranes* of the body-outlets become red and inflamed. *Foeces*—get smaller in quantity and ultimately cease.

7. *Skin*—is in wrinkles and scurfy ; *pale* and anaemic ; *purpuric spots* appear here and there on skin.

8. *Eyes* are glistening, wild and sunk. *Pupils* are dilated.

9. *Putrescent smell* issues from body.

10. Delirium or *convulsions* may, and *coma* often does, precede death.

Treatment.—*Absolute rest, warmth.* Very gradually feed up, at first on *weak* slops, gradually increasing the nourishment.

Post Mortem Appearances : (*None characteristic*).

1. *Body wasted*, therefore unusually *light*. Absence of fat even in omentum, which is, in many cases, itself absorbed.

2. *Gall-bladder* is full of bile. [This is not pathognomonic. All that it indicates is the non-passage of food over the orifice of its duct for a few hours preceding death.]

3. *Stomach* and *intestines* are *empty* and *contracted*, their structures *atrophied* and their mucous membrane *ulcerated*. [Found in children's summer diarrhoea too].

4. In children (in chronic cases) atrophy of *thymus* and *spleen* is found.

5. *Liver, lungs, heart, kidneys*—are destitute of blood.

Medico-legal points :

1. The **onset of death depends on**—(a) *Age*—the older the individual, the better he stands starvation ; (b) *Sex* :—females bear starvation worse ; (c) *Adiposity* of body—the more the fat, the longer the survival ; (d) Amount of *exertion*,—the greater it is, the quicker death occurs ; (e) Supply of *water* : onset of death is delayed by supplying water and quickened by its deprival ; and (f) *Temperature*—the colder it is, the quicker comes death. [*Death* occurs after 40% or $\frac{2}{5}$ ths of the body-weight is lost—in about 8 to 10 days, provided, no water or food is given ; life upto at most 2 months, has been recorded, where water alone was given. Death is due more to loss of *heat* than of nutrition. The **daily loss** is about $\frac{1}{24}$ th of body weight,—it is as follows :—Blood over $\frac{3}{4}$ of its weight ; pancreas and liver more than $\frac{1}{2}$; muscles and stomach, $\frac{1}{6}$ th ; skin and kidneys, $\frac{1}{3}$; bones, $\frac{1}{6}$ and the nervous system only 2 per cent].

2. Starvation-death may be **simulated by** death from exhaustion or from—diabetes, sprue, tuberculosis, Addison's disease, chronic dysentery, stricture of oesophagus, organic diseases of stomach, some obscure nervous diseases. [Starvation paves the way for *intercurrent diseases*, which may mask the true cause—fever, bronchitis, etc.]

3. A healthy man requires, during 24 hours, at rest, dry proteid 40 grammes, carbohydrates 200 grammes, fat 30—40 grammes, and water 52 oz, salts $\frac{1}{2}$ oz, and condiments, *q.s.*

4. Presence of hard foecal mass in intestines is not inconsistent with death from starvation.

5. No responsible person should undertake to *watch fasting prodigies*, as, in cases of their death, the watchers will be guilty of aiding man-slaughter. Most fasting girls are frauds and such of them as impudently hold on, die soon.

6. Death from starvation can be **proved only negatively**, (a) by excluding death from wasting diseases, (b) by comparing the body-weight with the age and height of the individual, and, (c) in life, by watching the effects of feeding.

CHAPTER VII.

WOUNDS AND INJURIES.

(A) GENERAL CONSIDERATIONS.

Introduction.—All wounds are either suicidal (self-inflicted), homicidal or accidental. The causes and means of effecting each are as follow : **SUICIDE** :—*Causes* : Mental upset (from religious fanaticism, fit of impulse, chronic indulgence in drinking, imitative mania, remorse, shame or grief) or continuous or excruciating physical pain, fit of passion—chiefly in persons with bad heredity or constitutional taint. *Means* : hanging, drowning, taking poison, by cutting or stabbing, by fire or fire arms or by other means (*e.g.*, throwing oneself under car of Jagannath or burning on funeral pyre or allowing burial alive. **HOMICIDE** : *Causes* : Revenge for wrong done by either victim himself or by any other party, obligation of religion or of society, for sake of plunder : hence, murder may be committed even with the consent of victim. *Means* : cutting, stabbing, strangling shooting, poisoning, burning.

Modes of inflicting tortures : (1) Rolling bamboo across bare chest (bans-dolla), (2) striking over sole of foot with a hammer (3) twisting a limb, (4) clubbing a man after thickly wrapping him up, (5) pulling out hair in front of ears, (6) whipping, (7) branding with red-hot iron, (8) seating man on sheet of ice or keeping him immersed neck-deep in water, in mid-winter night, (9) splashing hot fluids over body, (10) driving pins under nails, (11) keeping one's naked body exposed to midday sun or to wintry air, (12) inserting into nose, navel, axilla, ears, rectum or vagina, chillies, beetles, cockroaches, nettles, twigs of 'lal chitra,' (13) whipping with nettle (14) compelling to eat foeces or other abominations, (15) passing very powerful electric currents into the body, (16) putting hard wedges between knuckles of fingers and squeezing the latter, (17) hanging one by the legs, (18) squeezing the testicles, (19) starving, (20) exposing to fumes of chillies.

Definition. (1) **Surgically**,—a wound is a *visible* solution of continuity of true *skin*. (2) **Legally**, 'A wound is a solution of the natural continuity of *any* of the tissues of the body.' [A contusion, concussion, rupture of an internal organ, though not a wound surgically, is one legally.]

Classification of wounds :

- | | | |
|---------------|---------------|-------------|
| 1. Contused. | 2. Lacerated. | 3. Incised. |
| 4. Punctured. | 5. Gunshot. | |

Dangers to life, from a wound :

I. Immediate, Imminent or direct.

1. **HÆMORRHAGE**.—*Fatality depends on (a) Sudden and rapid loss of blood ; ∴, wounds to arteries are more dangerous than those to veins. (b) Total quantity lost* (externally or internally) ; ordinarily speaking, the total amount of blood in body is $\frac{1}{8}$ th of body-weight (= 12lbs) ; loss of 5—8lbs. is fatal.

Watson. [Remember that the whole amount of blood effused into a cavity of a corpse or its surroundings may not be due to bleeding during life : some of it may be due to p. m. oozing.]

(c) Previous *ill-health* and *bleeding habit* of body. (d) Extremes of age and female sex. e) "*Personal equation*." (f) *Situation* of hæmorrhage in—heart, brain, pericardium, liver, lungs, windpipe etc. (g) Functional *depression*, from any cause. [*P. M. Appearances* : general pallor and shrunken, pale condition of viscera, including heart and blood vessels].

2. SHOCK—*i.e.* sudden, reflex inhibition of heart. If there are signs of *reaction* present, shock rarely proves fatal. Shock may be produced by (a) *violence*—as crushing of a limb; a healthy person may also die from the *combined* effects of a number of superficial *trivial injuries*, without the existence of any *mortal injury*; by (b) blow on *head, heart, epigastrium, testicle*—which may leave no marks. (d) Intensity of shock depends on the individual, the cause, number and extent of injuries.] [No characteristic *P. M. Appearance*.]

3. INJURY TO VITAL PARTS—*e.g.*, brain, eyes, spinal cord, heart, lungs, intestines, liver, peritoneum. Head injuries specially cause insidious death.

II. Remote.

1. INFLAMMATION AND ITS SEQUELÆ :—(a) Blood-poisoning, (b) Erysipelas, (c) Tetanus, (d) Gangrene (e) Secondary hæmorrhage (f) Fever, (g) Exhaustion. [The more clearly fatality is traced to these accidental causes, specially in cases of slight wounds, the less may become the guilt of the assailant].

2. SCARRING (as in urethra, ureters, œsophagus, intestines) hernias through scars etc. [Ascertain whether scarring in these regions is the result of previous disease in those organs].

3. OPERATION (OF A SEVERE KIND) BEING NECESSITATED.

[Some of these effects are (a) *exaggerated* from presence of diseased or weakened tissue, or weakening influences, *e.g.*, alcoholic habit etc., or (b) *due to neglect, e.g.*, want of proper treatment, or disregard of surgeon's advice or indulgence in

excesses. *None of these acts of negligence goes towards mitigating the offence of the assailant.*]

Antemortem wound versus Postmortem :

1. *Hæmorrhage* is arterial, in spirts and profuse ; coagulation (showing fibrin) of effused blood occurs.

2. *Edges*—suffused with blood, everted, retracted.

3. *Inflammatory reaction*—present.

4. *Colour changes* in the extravasated blood—present.

1. *Hæmorrhage* of venous blood, not in spirts, slight in amount, thin, and blood is not clotted for long.

2. *Edges* not injected, are close and loose.

3. Absent.

4. Absent.

[Remember that there are no decisive characters by which wounds inflicted 1 – 1½ hours after death can with certainty be distinguished from antemortem wounds.]

Points for examining wounded persons :—

1. **Preliminary** :—(a) Obtain a **history**, but do not swallow a story, particularly, if it is volunteered by an ‘eye-witness’ about use of particular weapons. [Remember, that during the course of a trial, versions about assaults may change into those of accidents or vice versa !] (b) Note if *blood-stains*, *inflammatory reaction* (pus, granulations &c.), *foreign bodies* (hair, grass &c.) *discolourations* etc. are visible. (c) Then clean each up and examine minutely as regards :—

2. **Nature** (incised, punctured etc.)—to form ideas about (a) the nature of *weapon* used and (b) *danger* to life. [Remember that the same weapon can produce various kinds of wounds.]

3. **Number** : to determine (a) Amount of *shock*. [A large number of small wounds is equally dangerous with a single large wound.] (b) Amount of *hæmorrhage*—arterial or venous. (c) Evidence of *struggle* (d) *Nature of weapon* used. (e)

Possibility of self-infliction (or otherwise)—if there be a large number of wounds, all very severe.

4. **Situation** : as regards (a) *Organ wounded*. (b) *Neighbourhood of important structures* [∴ danger to life, as in penetrating wounds of eye] (c) *Self-infliction or otherwise*. (d) *Weapon used*,—with reference to proximity to bony prominences.

5. **Direction of each i.e.**, relative position of assailant and victim in regard to each wound. [Clue to direction is found from (a) *direction taken by blood*, (b) *direction taken by broken ends of bones*, (c) *wounds of entrance and of exit*, and (d) in the fact that *a cut is usually shallower at the end last made*. [Fallacies : (a) An assailant's hand from behind, coming in front, acts like victim's own hand working in front. (b) The cutting surface of all weapons is not set at one invariable angle to the handle. (c) A man may not remain in exactly the same position in which he fell. (d) Even after being mortally wounded, a man may be capable of moving voluntarily or automatically.]

6. **Depth** of each, especially at the ends,—to judge of the *danger* to life and of the nature of the weapon. [Probe gently. Dissect into the depth of the parts, without disorganizing the skin-tear. Look for presence of (a) *concealed hæmorrhage*, (b) *foreign bodies* and (c) *sepsis*.]

7. **Dimension or size**,—to ascertain *mode* of infliction and *danger* to life. Give *exact* measurements of *length*, *breadth*, *depth*. [A wound lengthens out, when it runs along a muscle and contracts when transverse to it. Draw diagram of shape and measure wounds in reference to fixed bony points nearest.]

8. **Edges and shape**,—to ascertain (a) *antemortem* or *post-mortem* causation ; (b) the kind of *weapon* and (c) the *manner of using* it.

9. **Dress**.—Examine it for cuts, indentations, perforations, blood, and dirt, and their correspondence with wounds on the body.

Medico-legal points.

1. **Is a wound (immediately) dangerous to life?** To give an opinion, consider (a) the *number, position and depth* of the wounds; (b) the amount of *shock, hæmorrhage and injuries to vital parts*; and (c) state of *health* of the organs. Do not judge from general surgical knowledge, but upon the case in point. *Never give a positive opinion*, if the wound is healing or healed. Consider, if the injuries, in the absence of any diseased condition found, would still have proved fatal. [If in doubt, state your doubt plainly to the jury and do not wait for the cross-examination to elicit it.] Under certain circumstances, the infliction of an injury resulting in death is murder, if the injury is "*sufficient in the ordinary course of nature to cause death* (I.P.C. § 300); but it is manslaughter, if the injury is one "*likely to cause death*" (I.P.C. § 299) [1 Bom. 342].

2. **Late fatality.**—If, after 366 days of receipt of injury, a man dies from its effects, it is not homicide according to English law, but is so, according to Indian law.

3. **Latent causes of death in wounded persons** are: Apoplexy, heart diseases, latent effusion on brain or into cavities of chest, diseases of large blood vessels, phthisis, inflammation of thoracic or abdominal viscera, rupture of a deep-seated abscess or of stomach or intestines, internal strangulation, etc. *The presence of pre-existing mortal disease* unknown to the assailant does not exculpate him.

4. **Which of the two wounds, received at separate peoples' hands and on different occasions, is fatal?**—This can be judged (a) by holding a p.m., (b) by taking each wound by itself and (c) by deciding if each of them could be fatal by itself.

5. **Is a wound, or are some wounds, the cause of death?**—Do not opine unless you hold an *autopsy*. A man, run over by a passing carriage, may have fallen dead from verandah

above (from the effects of apoplexy) before he was run over. After dangerous flogging, one may commit suicide by poison.

6. **When was a wound inflicted?**—You cannot be exact, because the states of *health* and *causes* are various and *healing* commences from moment of infliction of injury; but in small, clean wounds—

- (a) *Blood*,—(i) in wounds inflicted during life, coagulates in the Bengalee in $1\frac{3}{4}$ to $2\frac{1}{2}$ minutes and in Europeans in 4—7 minutes; if shed within 10 minutes of death,—it also rapidly clots. Otherwise, in the dead body it clots after at least 4 hours. (ii) If blood is found liquid—find out whether it is natural or putrefactive fluidity.
- (b) *Bruises*—begin to change colour after 18 hours.
- (c) *Scabs*—in clean small wounds, form in 10 to 24 hours.
- (d) *Inflammation*—commences in surgically dirty wounds in 20 to 40 hours.
- (e) *Granulation tissue*—forms towards the end of a week.
- (f) *Callus*—forms in about 10 to 12 days and hardens in 6 weeks to 2 months.
- (g) *Dislocations*.—Their age can be guessed, only vaguely, from the chromatic changes in local bruises.
- (h) *Scars*—(in clean linear cuts) form in 2nd week.
- (i) *Suppuration*—once commenced (towards end of 40 hours) may continue indefinitely. [In case of flabby and anæmic persons, healing may be postponed.]

Age of injury, therefore, is probably—

- (a) *24 hours before death*—if signs of vital reaction and of change of colour in bruises are present.
- (b) *Shortly before death*—if arterial spirting of blood, gaping of edges and considerable bleeding are present.
- (c) *During life, or, shortly after death*—if the blood found in the wound is clotted.

- (d) *During life, or, within three hours of death*—if edges of the wound are retracted and everted and there are present signs of ecchymosis.

7. *Will it lead to permanent injury?* In answering this, draw upon your general surgical knowledge. Symptoms such as follow railway accidents are uncertain and difficult to deal with.

8. *In certifying a case*, note whether it is 'simple' or 'grievous'.—"Whoever causes bodily pain, disease or infirmity" causes **Simple hurt**. (I.P.C. § 319). **Grievous hurt** is caused by any of these : (a) Any hurt which *endangers life* or causes the sufferer *for 20 days* to be in severe bodily pain or unable to follow his ordinary pursuits ; (b) permanent *disfigurement of head or face* ; (c) permanent privation of—sight of either *eye*, hearing of either *ear* ; (c) *fracture or dislocation* of bone or tooth ; (f) destruction or permanent impairment of the powers of any *member or joint* ; (g) *emasculation*. Thus, we can grievously injure a person without shedding a drop of blood. [I. P. C. §§ 320 to 325]. The other penal clauses of I. P. C. are : Attempting homicide (§ 307), attempting suicide (§ 309), abetment of murder, abetment of suicide (§ 305, 306), culpable homicide or manslaughter (§ § 298, 299), doing a rash and negligent act (§ 304A.).

9. *Is the blood menstrual?*—*Epithelial debris* and *mucous globules* from vaginal wall, when present, are in favour of the blood being menstrual, specially, if it is also *acid* ; but their absence does not negative the probability altogether.

10. *Was the blood shed antemortem?*—Yes, if there are present (a) *spiriting* and (b) *fibrin clots*.

11. *Is the blood from victim or assailant?*—Except when malarial *parasites*, trypanosomes, *filaria sanguinis hominis* or other peculiarities are present in the blood of one of them, this question cannot be answered medically.

12. Operation and Guilt.—[On a wounded person, postpone operations of *election*, until you get consent and consultation with a colleague ; but do operations of *necessity*, if you get the consent.] (a) If an operation of *necessity* (i.e., one that, in the surgeon's opinion, afforded the *only* chance of immediately averting the otherwise fatal issue)—is performed *skilfully*, and the patient dies, subsequently or then and there, the assailant's guilt continues, even if the case was treated erroneously but bona fide. (b) If death is due to *unskilful operation*, assailant is exculpated. (c) Assailant is exculpated also, if death follows an operation that is needed by the previous *maltreatment* of the wound by any other surgeon. [Remember that—(a) the onus as to the necessity of the operation and the skilful manner of its performance is on the surgeon who did it ; therefore, always seek a consultation ; (b) in cases of injuries, in spite of all care, death from chloroform may occur unexpectedly, before the operation is commenced or during it.]

13. Non-fatal wounds are self-inflicted (with a view to excite sympathy, or wreak vengeance) if they are:—(i) *Superficial*, tailing off at one end. (ii) on *non-vital, exposed* and easily accessible parts of body. (iii) *Many* in number (with a tendency to *parallelism*). (v) They are *disproportionately smeared* with blood. [Exceptions : (a) Lunatics, those who are passing through temporary fits of insanity, vengeance-seekers, people under religious frenzy, or determined suicides, may *fearfully mutilate themselves* or strike *vital parts* in a *violent manner*. (b) Though presence of multiple *dangerous wounds* on different, but inaccessible parts of body, or too close over one spot, points to homicide, multiple *stab-wounds* of chest, if very close to each other, point rather to suicide than to homicide.]

14. Fatal wounds are likely to be suicidal if :—

(a) They are *incised, punctured, or gunshot*. [In rare cases, jump from heights or explosion of explosives inside mouth or

around one's body causes *lacerated* and *contused* wounds and thrusting red-hot iron into abdomen or setting fire to one's clothes causes *burns*.]

(b) *Two or more important organs* are injured, or there are *many slight* wounds ; or if *genitals* (male) are injured.

(c) Their *direction* be (most men being right-handed) :

- (i) from left to right (cuts) right to left (stabs) ; or on left side of body ;
- (ii) from above downwards (in upper part of body ;
- (iii) from below upwards and inwards (in lower parts.)

(d) They have *antemortem* characteristics and they *fit* in with the weapon found.

(e) *Cadaveric spasm* be present.

(f) *Circumstantial* evidence showing *design* be present, e.g., (i) Letters announcing the deed (But—beware of forgery) ; (ii) Doors having been barred from within. (iii) Absence of poisons in viscera. (iv) Presence of mental aberrations or grief.

15 **Fatal Incised wounds are likely to be homicidal, if —**

(a) They are (most or all of them) *severe* (deep), *several* in number, and situated on *vital parts* of the body, and *directed upwards*. [Direction is more important than situation]

(b) They are on *inaccessible* parts of the body. [It is possible for a homicide to reproduce wound in any situation made by a suicide ; but not vice versa].

(c) The victim has got *bruises* or *cuts* on palm, palmar aspects of fingers or forearm ; or, has *firmly gripped* hairs, torn cloth &c in his hands (=Resistance, Self-defence)

(d) The *fixed objects about* the corpse do not bear any causal relation to the wounds.

- (e) Body and floor bear mark of *interference* or body appears *contorted* (struggle or its clothes *disarranged*)
- (f) Breasts, genitals, nose, ears etc. are *mutilated*.
- (g) *Weapons*, with marks of ownership by victim be lying at a distance or be *lightly* grasped by victim.
- (h) *Foot prints* on ground and *blood marks* elsewhere are present.

16. **Fatal wounds are probably accidental, if—**

- (a) Situated on *one side* or *aspect* and *exposed parts* of the body ; (b) *Directed from below upwards*—in cases of puuctures and stabs ; (c) *Too many* in number, and are of the nature of—(d) *Coutused* wounds, fractures and dislocations chiefly.

17. **The parts of body commonly selected—**

- (i) *By Suicides* = vital parts in front or at sides ; e. g.—

Throat	Head	Orbit
Cardiac area	Abdomen	Mouth.
Vessels at elbow or ankle		Temple

- (ii) *By Homicides* :—

Throat	Chest
Abdomen	Supraclavicular fossa

18. **Nature of weapon used.** (1) [*Preserve* foreign bodies found inside a wound, also the cuts and tears on garments and in case of dead bodies, the broken ends of bones and the wounded tissues] (2) *Take photos* of the skin-wounds. (3) State only the *nature* of weapon of causation and *never certainly identify any weapon produced* but merely testify to its probability or otherwise.] *To determine the nature of weapon used*, note—(a) the edges, whether or not *clean* cuts, whether *inverted*, or *everted* ; [use magnifying lens, and note whether there are

side-cuts ; (b) length ; (c) shape ; (d) condition of skin—as to toughness and *mobility* ; and (e) condition of garments.]

(a) INCISED WOUNDS have clean, regular edges, with profuse bleeding. [*Fallacies* : (i) In young beings, their skin being *elastic*,—the skin-hole is smaller than the instrument causing it. [But much depends on the amount and direction of *force* used, and the tip of a knife may inflict as long a wound as a big sword.] (ii) If victim is *old*, whose skin is *inelastic* (as on the *throat*), a sharp instrument may *jag* and *button-hole* the skin, leaving bridges of entire skin intervening between. (iii) If skin has *retracted much*, the wound is wider than the breadth of the weapon. (iv) A *long* incised wound is caused by a sharp instrument with *short* edge (as a razor, if it has *shallow tails* ; by *long-bladed* instrument (as a sword) if the *bone* beneath has been cut through. [The edges of *European* swords being not very sharp, produce more contused than incised wounds ; the *Asiatic* sabre on the other hand, produces non-contused, extensive (in length and depth) clean-cut incision]. (v) Differentiate an incised-looking wound produced by a blow on a part of the body *where skin is stretched over bone*, from a really incised wound].

(b) PUNCTURED WOUNDS : (i) Those produced in *living* people with *elastic* skin, will be smaller in size than the weapon used, if the same is blunt ; or larger, if the weapon is sharp. (ii) If *weapon is one-edged* (the back of the blade being flat and blunt), the wound is triangular ; if *double-edged*, it is diamond shaped. (iii) If caused by *fall* on anything pointed, foreign bodies are likely to remain inside. (iii) The *depth* will usually be equal to the length of the penetrating instrument, unless driven with much violence, in which case, there will be relative inequalities. (iv) In through-and-through-stabs, *entrance* wound is larger, the edges being sometimes everted.

(c) LACERATED WOUNDS are easily detected and attributed to accidents or instruments that tear the tissues, rather than cutting them. [N. B. Examine with magnifying lens.]

(d) CONTUSION, BRUISE, ECCHYMOsis.—Guess the nature of the causative weapon, carefully examining the wound (as to its situation, direction, number, depth and shape) and presence of grass, mud, gravel &c. [A very powerful man is capable of fracturing the human skull by his fist-blows.]

(e) *The same weapon may, according to the manner of its use and the parts struck, cause different kinds of wounds.* [1. P. C. §§ 324, 326 make the penalty graver with certain kinds of weapon used.]

19. **Preternatural frangibility of bones** is found in those suffering from rickets, tertiary syphilis, 'mollities ossium,' pregnancy, general paralysis of the insane.

20. **Consequences of wounds on a man's capacity for work.** [As a patient *simulates* much and *exaggerates* much, enquire, especially in cases of *mental derangements*, if he exhibited some signs of derangement before the injury.] If a wound causes internal hæmorrhage, it is not necessarily immediately fatal. Individuals after receiving mortal wounds have exhibited considerable powers of movements. A man with a rupture of *liver* has lived 5—11 days; with ruptured *intestines*, 10 hours; with fracture of *base of skull*, 3—12 days &c. With injuries to *brain* and loss of brain matter, men have walked and performed voluntary acts.

(B) EXAMINATION OF STAINED ARTICLES.

Stains may be due to

1. **Blood**—*human* or not; if human, it may be *venous* or *arterial*; *menstrual* or not; from a *male, female* or *child*.

2. **Red colouring matters** like—cochineal, alkanet, log-wood, madder, betel juice, fruit or flower juice, iron-moulds, rust, red paint, rose anilin, &c.

3. **Semen.** 4. **Pus, chyle, lymph.** 5. **Other substances.**

Procedure for dealing with Stains : They are to be sent to Govt. Chemical Examiner or Serologist.] See p. 47.

(A) BLOOD-STAINS.

To prepare for examination : If stain is—

Fresh or recent,—dissolve it out by any of these : Aq. destill., glycerine + H_2O (1 : 10), cold saturated sol. of borax, liq. ammoniæ (B. P.), saline solution (85%). **Old** :—dissolve in any of these : Sol. KOH (Sp. gr. 1.017) (30%), glycerine, glacial acetic acid, sulphuric acid in absolute alcohol (1 : 20). **On treasy surface,**—first wipe it with ether, and then treat as above. **On coloured fabric,** boil and treat with KCN (10%) solution. **On hard surfaces** :—may be scraped or dissolved out

KCN solution or, in liq. ammoniæ, followed by digesting the filtrate with HCl or by heating them. **Heating** blood-stain (1) 56°C—destroys all the erythrocytes ; (2) 200°C—provided the stain is on a hard surface (glass, wood, iron etc), = does not destroy all erythrocytes ; (3) 110°C—160°C = renders the stain difficultly soluble ; (4) 160°C = renders it somewhat soluble. Heat and age break up hæmoglobin into hæmatin and globulin. **Demonstration of presence of blood is difficult**—if (1) the blood has been *long* effused, the hæmoglobin having become methæmoglobin or even iron-free hæmoglobin, (2) the spot has been first *wetted* in *cold, alkaline* liquids (soap) and then dried ; (3) the blood has been mixed with other substances like *chlorine, alkaline carbonates &c.*, or, (4) the spot on the linen has been much *rubbed* and the cloth *washed* in *cold water*.

Chemical Tests : [*All that these tests tell us is, whether stain is that of blood—and no more*].

1. Blood + H_2O = *bright red* solution (if recent) or *greenish brown* (if old)

2. Blood + H_2O + heat ($170^{\circ}F$) =

(i) Gives flocculent, muddy, *brown precipitate*, which is re-soluble in (a) hot KOH ; or (b) in weak NH_4OH , yielding a *green* colour by reflected light and *red* by transmitted light (*dichroic*) (c) The precipitate re-appears on addition of HNO_3 .

(ii) Its colour is destroyed ; so too, if HNO_3 is added.

3. Aq. sol. + HNO_3 = whitish-grey precipitate. (Orfila)

4. **Van Deen's Test :** Aq. sol. of blood + fresh, weak tr. guaiac. resin. = *reddish brown ppt.* This ppt. + H_2O_2 or O_2 or old oil turpentine = *brilliant blue colour*. It is a *very delicate test*,—obtainable even in 1 : 2500. [FALLACIES : a) Very old stains may not yield this test. (b) This test is also answered by—sweat-stains, bile, foecal matter containing bile, some ferric salts, copper salts, horse-radish juice and rust—all which turn blue on addition of guaiac. solution *alone*,—before H_2O_2 is added.]

5. Aq. solution (*cold*) of blood + NH_4OH (*diluted* and in small quantities) = no change of colour ; but if *strong* NH_4OH is added = *brownish colour*. (Orfila)

6. **Schaer's Test :** Stain + fresh Barbadoes aloin sol. (4%) + Ol. turpentine = red, turning into permanent cherry-red colour.

7. Stain + KCN solution + $(NH_4)_2S$ = cherry-red colour of *cyan-hæmo-chromogen*.

8. One c.cm. of defibrinated *human* blood + 250 c.cm. of 12-volume solution of H_2O_2 = 600 c.cm. *oxygen is liberated*. [The *definite quantity* of oxygen liberated distinguishes human from other blood].

9. Stain + 1% solution of benzidine + H_2O_2 + acetic acid = *bluish green colour*. [This test is also answered by diastases, zymases and fruit juices. While a positive test does not prove blood, the negative proves its absence]

Spectroscopic Tests : [Always have by you control human-blood-spectrum]. *The spectra of blood are constant and characteristic.*

1. **Cyan-Hæmo-chromogen** (*vide* chemical test 7, above)—shows 2 bands between D and E. [*Very characteristic.*]

2. **IF STAIN IS RECENT (=oxyhæmoglobin) :**

(1) If it is *oxyhæmoglobin*—2 dark absorption bands appear, one of which is at D line, the other between D and E, and nearer latter, and there is darkness from F on to the right end.

(2) *Reduce* oxyhæmoglobin by Stokes's fluid (=tartrate of potash + $\text{Fe SO}_4 + \text{NH}_4\text{OH}$) and get one broad dark band occupying nearly the whole space between D and E.

(3) *Reoxidize* the hæmoglobin by shaking it with air and look for oxyhæmoglobin lines, and so on.

3. **IT STAIN IS OLD (=methæmoglobin) :** (a) Then, besides the two oxyhæmoglobin bands (fainter) we get a third dark band between C and D, (but nearer to C), and a further faint one between E and F. Reduce methæmoglobin by $(\text{NH}_4)_2\text{S}$ and reoxidize, as above.

(b) To it add H_2SO_4 conc. + heat = **hæmatoporphyrin** ;

either (i) Add to it alcohol and water = *acid* hæmatoporphyrin, which shows 2 bands between D and E ;

or (ii) Add KOH in excess = *alkaline* hæmatoporphyrin, which shows 4 bands—one between C and D, 2 between D and E and another to right of E.

Biochemical Tests. [*These tell us if blood is human*]

(1) **Hæmolysin test of Deutsch.**—A rabbit or any other animal is thrice injected with defibrinated *human* blood (=anti-serum production). This rabbit's serum + unknown stain, if it results in *complete hæmolysis*, proves that the unknown stain was human. [This test is successful if a *sufficient amount* of blood with *intact erythrocytes* is available, and is not absolutely dependable.]

(2) **Agglutinin test (Marx-Ehrnrooth).**—If the erythrocytes of a *known* sample of *human* blood + extract of an *unknown* stain, then one of these occurs : (a) erythrocytes are *clumped or agglutinated* = mammalian blood, not human ; (b) erythrocytes *form rouleaux* = human ; (c) erythrocytes *become polygonal* = simian. [*This reaction is also obtained with—*juice of lemons and grapes, fresh albumin, putrid blood and meconium. This reaction is *prevented*, if stain is heated to 70°C.]

(3) **Precipitin test (Uhlenhuth).**—Any albuminous fluid injected into an animal, forms in that animal anti-serum, which gives a 'precipitum' almost at once, at the points of contact with that albuminous substance. Anti-serum obtained from a rabbit (previously injected with sufficient dose of human serum), if very diluted and mixed with neutral or faintly alkaline solution of unknown serum, (*if human*) will at once give a cloudiness, the reaction of precipitation being completed within 20 minutes. In this way, we can tell a cat's blood from dog's or pig's from ape's. [Stains that are old or decomposed or even mixed with earth, react ; but washed stains (which contain no albumin), or stains mixed with K_2MnO_4 , $HgCl_2$, $CaCl_2$, $CuSO_4$, $FeSO_4$, Na_2S_3 , $ZnCl$ do not answer it. *This test is a delicate and specific one*].

(4) **Complement Deviation Test (Moreschi)** —It is based on the fact that an anti-serum, in the presence of *homologous* albumin, causes complement deviation. If anti-*human* serum (obtained by injecting a fowl with known human serum) is mixed with extract of *unknown* stain [and + guinea-pig's serum (complement) + anti-sheep hæmolytic serum (ambo-ceptor) + sheep's corpuscles] and this mixture deviates the complement (*i.e., inhibits hæmolysis*)—then that *unknown* stain is *human*. [*This test is delicate and dependable*].

(5) **Anaphylaxis test (Sutherland).**—*Anaphylaxis is specific*. Hence, make an extract of a stain and inject, say 100 cc into a

series of guinea-pigs. Wait say 10 days. Then inject into some of these, 2 cc doses of various known sera : fall of temperature and shock with a known species of serum will determine the blood that caused the stain.

Microscopic Tests : [These tell us (a) if a stain is *blood* or not ; (b) if it is *mammalian* blood and (c) *differentiate*, if fresh, *human blood from blood of birds, fish and reptiles*. Observe if hairs, feathers, scales &c., are sticking in the blood]

IF BLOOD IS NOT MORE THAN 24 HOURS OLD,—look for (a) *fibrin* in clots ; (b) *corpuscles*, which, if human, are : biconcave, *circular, non-nucleated*, about $\frac{2}{3200}$ inch in diameter. [Baby's blood is sometimes nucleated [Except that of camel and llama, the erythrocytes of all mammals are circular ; and birds, fishes and reptiles have elliptical, nucleated erythrocytes].

2. IF BLOOD IS VERY OLD, look for **Teichmann's chloride of hæmin crystals** :—stain + NaCl crystals + glacial acetic acid = dirty brown fluid ; this + heat = minute rhombic plates [If such-like crystals + H_2O_2 = froth, then it is blood ; if no froth = indigo-dye]. *This is a sure proof of blood*. If, however, the stain has been washed with absolute alcohol, water, alkaline caustic carbonates or chloride of calcium, pot. chloratis, then these crystals may not be obtained.

Medico-legal points :

A stain is that of blood, if it answers all the sure tests mentioned above. Never give an opinion from only one kind of test.

'**Human Blood**'—can be vouched for, if the more reliable *biological* tests are positive.

Age of stain cannot be testified to, unless it be recent ; a stain *older than a week* is like a stain years old.

Arterial blood is of bright scarlet colour, **venous** blood, of dark red colour, which, if exposed, becomes bright red. Hence, it is unsafe to pronounce which it is.

Children's blood (at birth) forms a softer and thinner clot and the corpuscles may be *nucleated*.

Menstrual blood may be alkaline (if profuse), or *acid* (if scanty) is *thinner* than ordinary blood, and may show *epithelial scales* from the genital passages. [But blood flowing from wounds to genitals cannot always be differentiated from menstrual blood.]

(b) SEMEN.

[Semen is identified even years after its discharge by the **Spermatozoa** contained in it. Spermatozoa **LIVE** in the vagina for some days after a woman's *death*; in the *living* woman, they retain life for over two weeks. Not every specimen of semen, even if from a healthy youth, contains spermatozoa and they are, as a rule, **ABSENT** from the semen of the very young, the very old, those suffering from chronic testicular trouble or sexual excesses or chronic constitutional diseases. To **FIND THEM**, examine *dried* pubic hairs, *freshly dried* stain on undergarments, and vaginal mucosa].

Physical Characters : (a) **WHEN FRESH**—It is a *thick, greyish-yellow, translucent* liquid, with *characteristic odour*. (b) **WHEN DRY**, the part looks glistening and is stiff—as if it were *starched* or smeared on with pus. (c) **ON HEATING, RUBBING, MOISTENING**, or treating a stain with HNO_3 ,—it emits its characteristic odour and looks more yellowish. (d) **OLD STAINS** have to be softened with HCl dil. (1 in 40) and stained with methyl green, previous to examination. **Microscopic Characters :** The finding of at least one *complete* spermatozoon in a fluid or stain is proof positive of the fluid or stain being semen; but *the absence of spermatozoa from a fluid or a stain by no means negatives its being semen*. The **human spermatozoon** has a *attened, oval, transparent head* and a slender long tail [The

trichomonas vaginæ, found in unhealthy vaginæ, possesses a granular, roundish, flagellated head, which is as big as a red corpuscle and it possesses more than one cilium]. Spermatozoa may NOT BE VISIBLE owing to (a) too many bacteria being present, (b) decomposition having set in.

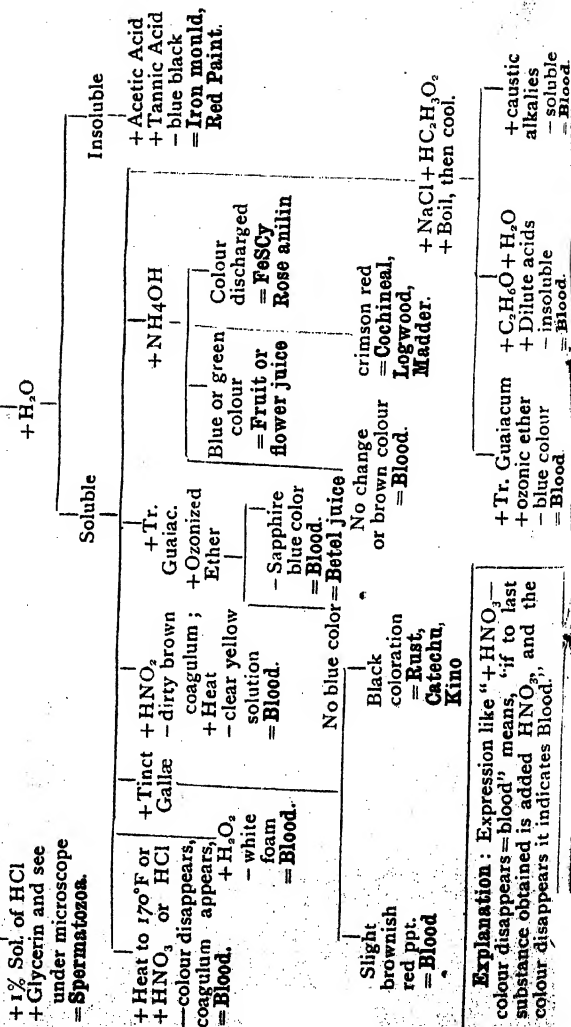
(c) MECONIUM.

It is **made up of** bile-coloured granules, intestinal epithelium, mucus and cholesterine. It produces stiffness and brownish-green stains on fabrics, which are removed with difficulty.

Tests : (1) + H_2O = acid liquid. (2) + HNO_3 , H_2SO_4 , Sugar = green and red compounds. (3) + hot ether = cholesterine separates.

SCHEME OF CHEMICAL EXAMINATION OF "STAINS."

Stains.



Explanation : Expression like "+ HNO₃ - colour disappears = blood" means, "if to last substance obtained is added HNO₃, and the colour disappears it indicates Blood."

(C) CONTUSION, BRUISE, ECCHYMOSIS.

Definitions : **Abrasion**=injury of superficial layer of skin. **Bruise**=an injury associated with extravasation of blood into the skin or with crushing or tearing of subcutaneous blood vessels. **Contusion**=bruise with extensive injury to soft structures. **Ecchymosis**=effusion of blood into subcutaneous tissues, owing to rupture of blood-vessels there. **Bruised or contused wound**=an ecchymosis accompanied with escape of part of effused blood through the breach in the skin.

Causes.—*Railway or machinery accidents, being run over, falls from heights, bursting of vessels, flogging, kicks, assaults with hard blunt weapons, bansdolla &c.*

Ecchymoses :

1. **If deep** :—(a) May not be visible, being characterized on palpation, by—*localized swelling, pain and fluctuation.* (b) *Discoloration*, if apparent, may not be over exact site of injury and not appear at once. [Hence, violence inflicted during life may terminate life but not make the bruise apparent till after death.]

2. **If superficial** :—Appear very rapidly after injury ; the subcutaneous *effused* blood is incorporated with the whole true skin, rendering it black—the margin round the black spot being of yellow colour.

Colour changes (in *superficial* bruises)—**Start from** the circumference. It is a purely **vital act**. The dark reddish-blue bruise becomes light-red-blue within 18 to 24 hours, then violet or brown (3rd day), then green (5th day), then light lemon yellow and finally discharges colour (8 to 10 days) [In vigorous health, the colour disappears in 3 or 4 days ; in old persons, in weeks. During that period, the spot *increases* in extent ;—the central part (where, violence was delivered) being darker. "In

some instances, bruise has disappeared without undergoing changes of colour at its margin"].

Dangers : (1) Extensive *inflammation* and sloughing. (2) *Shock*. (3) Secondary *hæmorrhage*. (4) *Tetanus*. (5) Spreading *gangrene*, *erysipelas* or diffuse *cellulitis*. (6) *Scarring*. (7) Crushing of *internal organs*.

Medico-legal Points :

1. **Production and size** (*i.e.*, quantity of blood affused) of bruise depend on—(1) *Amount of violence* used. (2) *Situation* :—(a) a *superficial* bruise appears very soon after infliction of injury and at the site of injury itself, (b) not so a *deep* bruise. (3) *Nature of tissues* : (a) *loose* tissues of face, labia, scrotum are more easily bruised ; (b) under dense membrane, bruise is scantily present ; (c) *yielding* anterior abdominal wall may not be bruised at all even in mortal accidents. (4) *General conditions of an individual*—delicate (women, children, old people), cachectic or purpuric &c. [Hence, *severe* blows on a body, within a couple of hours *after* death, while body is still warm and muscles flaccid, produce *slight* bruises, with all external appearances of *ante mortem* bruises].

2. **Bruises occur spontaneously** in (a) *hæmophilia*, *purpura*, *scurvy*, *whooping cough*, *malignant exanthemata*, *cholæmia* and *debility*. (b) In *very cold* climates or in the *very feeble* or *aged*, the ears, the shins, the fingers and toes may show spontaneous bruises. (c) Cases of *Strychnine poisoning* may develop bruises from severe action of convulsive muscles. (d) After death, *ecchymoses* are found on thorax and abdomen of those who die in a state of *intoxication*. (e) Old flabby women may develop bruises at the *slightest provocation*.

[CAUTIONS : (a) *Erythema nodosum* causes bilaterally symmetrical bruise-like discolourations on the shins. (b) *Drug eruptions* sometimes *simulate* bruises. In these cases, the skin is entire, the patches are of various shapes and sizes and too many in number, being perhaps also symmetrical.]

3. **Ante-mortem vs. Post mortem**—(See p. 25). (*a*) A bruise was caused about *24 hours previous to death*—if it shows signs of inflammatory repair or colour-changes ; (*b*) *within 3 hours of death*,—if it shows retraction of edges and “large” ecchymosis ; (*c*) it is *ante-mortem (but not known when caused)*,—if it presents—large amount of hæmorrhage, with external spirting of blood ; and (*d*) it was caused *very shortly after death (10 minutes)*,—if it shows clots.

4. **P. M. Bruises** :—*Severe* blows delivered within two to three hours *after death*, are capable of causing very slight ecchymoses, resembling the skin-appearances of those caused ante-mortem. [Continuance of life is not necessary to the full development of a bruise].

Clotted state of blood found in an ecchymosis, does not necessarily prove ante mortem effusion, for, clotting occurs in effused blood before or very soon after death. *Liquid* state of blood in an ecchymosis in a corpse may be due to (*a*) effusion after death ; (*b*) effusion before death, blood not having had time to clot by the time the inspection is made ; (*c*) putrefactive liquefaction.

5. The *nature* of **weapon causing** a bruise can be guessed only, from shape and size of the bruise ; the *manner of its causation* can be guessed from its situation, depth, concentration of injury, shape and other circumstantial events ; always give guarded opinion,* specially, if asked as to whether it was produced by blow or fall.

6. Severe contusions on both sides of body, or, both anteriorly and posteriorly, or, if found on insides of arms and thighs—usually point to **assault**. An insane man may also cause multiple bruises by design or by accident *e.g.*, fall from height.

7. On the contrary,—*a blow with a yielding weapon* may leave **no superficial marks**. A fatal blow on a *yielding part* (anterior abdominal wall) may leave no bruise externally nor in the tissues thereof. Chevers records that *bansdolla* may be inflicted without any external mark of violence but with lungs lacerated and ribs broken. If, on autopsy in a case no external mark of violence is found, but extensive ecchymosis or rupture of internal organs is discovered, the tissues interposed between the ecchymosed area and skin being uninjured, decision

as to external violence being the cause of the deep-seated ecchymoses will rest on a careful consideration of—(a) the history of the case (b) previous health of the part affected (c) liability of the part to rupture from causes other than violence.

8. A contused wound of **female genitalia** without being extensive or severe, may become **fatal** from bleeding. A blow on a part of the body where skin is stretched over bone (specially if made with the split cane) may produce an **incised looking** wound.

(D) LACERATED WOUND.

Definition.—Mechanical *rupture* by a *tearing* action, the edges of the wound being *irregular*.

Caused by—(1) *Weapons* which tear the tissues (broken glass &c.) (2) *Bites* of animals. (3) *Goring* by horned animals. (4) *Falls* on rough surfaces. (5) Machinery, street or railway accidents.

Characters of a lacerated wound :

Edges—jagged and irregular.

Tissues—protruding on to surface.

Skin—tagged on, in places.

Dangers : *Immediately*—not much. [There is practically no hæmorrhage]. *Secondarily*—profuse suppuration, tetanus, sapsræmia, erysepelas, gangrene, secondary hæmorrhage and scarring.

(E) INCISED WOUND.

Definition.—Wound with clean and *regular* edges.

Caused by *instruments* that are sharp or cutting, e.g., (a) broken glass, tin, iron or crockery. (b) Blunt or jagged-edged knives. (c) Sharp instruments e.g., knife,—with *motion sweeping* or cutting (as by razor), or *direct* (as by sword).

Characters :

(1) **Edges** *regular*, everted, *gaping*, clean-cut. [EXCEPTIONS:—(i) Edges may be *jagged*, owing to lax nature of tissue and uneven edge of instrument. (ii) Edges are *bruised* if (a) the motion given is direct, (b) the instrument is not very sharp or (c) much violence attends infliction of the wound.]

(2) **Shape** is usually fusiform—the wound *beginning abruptly*, *tailing off at the end*. (3) **Length**—is greater than depth.

(4) **Base** is wedge-shaped. [It is uneven, if the wound is caused by direct motion]. (5) **Bleeding**—is sharp and free.

Dangers :—**Immediate** : *Haemorrhage* is free and profuse. *Injury to vital parts* occurs : therefore, loss of their functions. **Remote** : *Inflammation* and its sequelæ.

Medico-legal points :—(See pp. 111, 112).

1. An *ante mortem* incised wound shows : (a) great *gaping*, with eversion of edges, (b) *inflammatory* reaction at its base (within 18 to 24 hours) or, (c) arterial *spiriting*, (d) profuse *bleeding*, (e) *coagulated* blood (as proved by fibrin). See p. 105.

2. **Incised-looking wounds**.—(a) Wounds of *skin stretched over bone*, caused by a blow with a *blunt* weapon, look like incised wound. But they have lacerated *bases* and irregular edges, with *bridges* of undivided skin. (b) *Lacerated cuts made by crockery* look incised, unless, with the help of a magnifying lens discovery of *side-cuts* at the edges help the differentiation. 'The actual edge of a piece of broken glass is probably sharper than the sharpest of knives.'

3. The *length of an incised wound* gives but little hint of the **length of the cutting edge of the weapon** producing it ; but the condition of under-lying bone (sword) or the *tailing off* of one end (razor) will indicate the length.

4. **Guessing the weapon.**—See p. 112. Though most wounds bear the imprimatur of the causative weapon, the following act as disturbing factors: (a) If skin is *elastic* (as it is in the healthy living individual), the skin-hole may be smaller; (b) if skin is *inelastic*, there will be jagging and button-holing; (c) if skin retracts much, the wound would be wider than *the cutting surface*; (d) the length of the wound would furnish little clue to the length of the blade, unless there be tailing at the ends (=short blade) or wound to bones below (=long blade).

5. **Weapon and wounds.**—Wounds caused (a) by *broken glass*—are arched, seldom straight; (b) by *sickles* and *scythes*—are in broken zig-zag lines; (seldom clean, straight, or complete cuts); (c) by *knives*—resemble dagger-wounds, because tips of all knives have a double sharp edge; (d) by *dao*—may look like a linear cut, extending from a punctured stab; or, if on a curved surface of the body, the punctured and the straight incised wounds may be separated by a bridge of entire skin.

6. **In measuring gaping wounds**, bring the two edges together or else the measurement will be short.

7. An incised wound bears but little relation to the **shape or size of the weapon used**. From the appearance of a stab-wound, do not depose to the weapon used.

(F) PUNCTURED WOUND.

Definitions.—A punctured wound is one caused by narrow or pointed instrument being driven into the body with a *stabbing or direct motion*. Its depth exceeds the superficial area. [A **penetrating** wound opens into a joint or body-cavity; a **perforating** wound goes through and through, with wounds of exit and entrance].

Characters : If caused by instruments that are—

1. *Sharp-edged* :—Incised wound, but of greater depth. [An ordinary knife is sharp on both edges, upto a certain length of its tip ; penetration to this depth will leave a *slit-like* opening, tailing at both ends ; beyond it, a *wedge shaped* wound. If the point of the weapon is blunt, the size of the wound will be smaller.]

2. *Rough and blunt* :—Contused, rough, irregular, having characters of the weapon used.

3. *Smooth, pointed, blunt or cylindrical* :—A slit resembling that caused by a double-edged knife.

4. *Triangular* :—Triangular.

Size and shape depend on—

1. *The direct or oblique manner of using the weapon* : (a) It is *smaller* than breadth of the weapon, if drawn out exactly in the same track in which it was driven,—owing, in cases of sharp weapons, to retraction of skin ; in cases of blunt weapons, to driving the skin before it. (b) It will be *broader* than the breadth of the weapon, if, as is common, a cutting oblique motion is given it, at withdrawing.

2. *The size of the weapon used.*

3. *The tension and elasticity of the skin* :—Stabs through folds of skin will present irregular-sized and larger wounds.

The same weapon may cause wounds of different classes, sizes and shapes.

Dangers :

1. Injury to vital parts. 2. Internal hæmorrhage.

3. Fractures of bones, if penetrated so far.

Medico-legal points :

1. With one external wound, there may be two or more internal stabs.

2. The weapon used may show no marks of blood if :—
(a) it has been *wiped by clothes* of victim ; or (b) *wiped by his protruding fat*, during withdrawal of weapon ; or if (c) *cut vessels have been compressed* by the sudden plunge of the weapon.

3. Sites of fatal homicidal punctures : *into brain* :—through fontanelles, under eyelids, through nostrils ; *into medulla or spine* : through nape of neck ; *into heart* : under breasts ; *into lungs* :—through axillæ ; *into abdomen*—through navel, rectum, vagina or under scrotum. These often escape detection and .∴, can be skilfully employed to kill children.

4. Most cases are accidental or homicidal. A medical pupil may commit suicide by stabbing over his heart. When punctured wounds are *self-inflicted*, their direction is from left to right and above downwards ; when *homicidal*, they may be in any direction, though, ordinarily, a *homicidal* stab is directed *from below upwards*, specially, if victim is recumbent. But so will an *accidental* stab be, if a person fell on a pointed substance.

5. In through-and-through stabs, (mostly *homicidal*) the entrance-wound is larger than the exit-wound ; and the edges may be everted, if the instrument has been rapidly withdrawn.

6. Ordinarily, the length of weapon used is equal to depth of a puncture, except where the blow is delivered, with much force (compressing the tissues.)

(G) GUNSHOT WOUNDS.

General Introduction.—(1) The barrel of a gun is a *straight channel* ; that of a rifle is *spirally grooved*, to minimise “leading” and to retain bullet longer in barrel, whereby result more complete

combustion of powder and more *steady retention* of axis by the projectile. Both gun and rifle have *long* barrels. (2) Firearms with short barrels are called **pistols** or **revolvers** (if the chambered part of their barrels revolve). Pistols and sporting guns have low penetrating power ; \therefore , they produce larger wounds. (3) **Shots** are molten *lead* balls, with an admixture of $\frac{1}{3}$ to $\frac{1}{2}\%$ *arsenic*. **Bullets** are metallic masses, charged or not with explosives. **Buckshots** are intermediate between bullets and shots. *Cartridges* are paper or metallic cases, containing gun-powder and *shots* or balls or bullets retained in place. They are capped in the centre by the 'detonator.' (4) **The principles of a gun-fire** are :—the hammer, by a sudden percussion on the "cap" of highly explosive fulminate of mercury, $\text{Hg}(\text{C}_2\text{N}_2)\text{O}_3$, detonator or, in case of antiquated guns, on a piece of flint, ignites the powder inside the barrel ; or the powder had to be ignited by a match-stick fire ; ignition of powder creates sudden expansion of gases and thus the projectile is thrown out. [Instead of *gun powder*, an *explosive* like cordite, or *gas* or *air* or *spring* may be used to project the projectile] (5) **Range of modern bullets** :—(a) Upto 500 yds the bullet crushes the cellular tissue into atoms and destroys cohesion of the tissue over an extensive area. (b) Between 500 to 1200 yards, bullet makes a clean passage, through all parts of the body, of its own calibre. (c) Between 1200 to 1800 yards, a bullet destroys the parts much, its wound of exit being 7 to 8 times that of entrance. (d) Beyond, the bullet loses force, though the killing-power may extend up to 4500 yards.

Old Guns

1. *Bore* = .45. They are of great *weight* and *size*.

2. Bullets are made of lead, are *spherical*, charged with *black-gunpowder*, which *blackens* tissues.

Modern Rifles.

1. *Bore* = .303. They are of less *diameter* and *weight*.

2. Bullets are cylindrical ($1\frac{1}{4}$ " long) with ogival head, made of Pb (hardened with Sb), encased in cupro-nickel, charged with *nitro* powders, which *do not blacken* tissue.

3. Bullets, intrinsically of low velocity, lose it as they traverse tissues, thereby horribly *crushing* them.

4. Wounds of exit are *very much larger*, with everted, *crushed* edges.

5. Bullets *can hardly* pierce one man after another, standing in a mass.

6. Bullets are *deflected*, or flattened against bone, fascia, or muscles suddenly starting into action.

7. They produce *greater shock* but *less haemorrhage*.

8. Wound is *larger*, badly contused ; \therefore , *sloughs badly*.

3. They possess enormous velocity, which they do not lose on penetrating tissues, thereby producing *punched-out, clean* wounds.

4. Wound of exit is *slightly* larger, with *no laceration* of edges.

5. They *do* so. [They have a hard outer covering.]

6. They are *not deflected* and reduce bones struck, into *atoms*, or punch out *clean* holes through them.

7. They produce *greater haemorrhage* and *less shock*.

8. Wound is *small*, with little contusion \therefore , *heals rapidly*.

Gun powder—is composed of $\text{KNO}_3 + \text{S} + \text{C}$. 'It expands, owing to sudden development of gases (CO_2 , CO , N , H_2SO_4 , CH_4 &c.) It *explodes* when raised by a sudden blow to 482° — 608°F and the temperature created at that moment is 4532° — 5432°F . In the open air, a grain of it can ignite another at a distance of 8 to 10 times its own diameter. *Good powder* has a uniform slate-gray colour (colour varying according to the proportions of C and S) is without white spots and it does not stain or crumble between the fingers. Humidity of weather renders it useless.

Nitro-explosives—are prepared from gun-cotton or nitro-cellulose. They are *smokeless*. Some of them are : Vieille, Poudre B, Blasting gelatine of Nobel, Ballastite, Amberite, Cannonite, E. C., Kynochs, Plastomenite, Rifleite, Cordite, Schultze etc. The other explosives or rather *detonators* (also called *disruptors*, they having maximum of local and minimum of projectile action) are—trinitro-

toluol or T.N.T., dynamite, silver acetylide, silver fulminate, chloride of nitrogen, ammonal, some diazo compounds. Lyddite, melinite and Japanese "Shimose Powder" are made chiefly from picric acid. *The products of an explosion* are: (a) gas—as for chloride or iodide of nitrogen; (b) gas and liquid—as for gun cotton and nitroglycerine; (c) gas with solid—as in case of gun powder.

Classification of gunshot wounds.

I. (a) *Direct*—caused by a body (like a bullet or the fragment of a gun which has burst) which is projected by the force of the explosion itself. (b) *Indirect*—caused by some body (a splinter or fragment of wall etc.) which has been set in motion by the projectile.

II. (a) Those caused by bullets from old pattern *guns* and (b) those from modern *rifles*.

Character of Gunshot Wounds :—[The nature of injury by modern bullets is dependent on (a) *shape* and *size* of missile, (b) the rate of *velocity*, (c) the *angle* at which it impinges against a part and (d) the *distance* fired from. The greater the shape and size, the more is the destruction of tissues; the greater the velocity, the less is the destruction; and every modern bullet, instead of travelling with its point in front, gets turned over and so strikes with an increased area of surface; and the greater the resistance offered to a bullet, the greater is the injury].

(A) When caused by old pattern musket bullets :

I. IF FIRED AT A DISTANCE (beyond 3 ft. and not less than 15—20 yards), and at right angles to the body :—

1. *The wound of Entrance* :

Opening—circular. [With bullet of low velocity, however—it is triangular].

Edges—Punched out, *inverted* and contused over a wide area, skin being slightly frayed.

Size—same as, or smaller than, that of bullet.

2. *The wound of Exit :*(a) If bullet *has* 'traversed' bone,—

Opening—irregular, ragged.

Edges—are everted : lacerated tissue, muscles, or spicules of bone protrude through them.

Size—'considerably' larger than that of wound of entrance.

(b) If bullet *has not* traversed bone,—

Opening—irregularly circular ; rather, triangular.

Edges—everted, considerably contused, and tissues are protruding through them.

Size—'slightly' larger than that of wound of entrance.

3. *Track of bullet* : lacerated, contused, of greater diameter than bullet.4. *Bone.*

(i) In its shaft (compact tissue) :

(a) Bullet either gets flattened against it without any injury to bone ; or,

(b) Breaks it into splinters, some of which are displaced up or down, others being driven forwards ; and at the same time,

(c) Fissures are formed.

(ii) In the cancellous ends—drills a hole, without comminution or fissuring.

II. IF FIRED CLOSE TO THE BODY (muzzle being within a foot of the body) :—1. *The wound of Entrance :*

Opening—irregularly triangular or stellate.

Size :—larger than that of bullet (from lacerations specially, when part of body struck is near a bone

Edges—are inverted, dry, punched out, lacerated ; they are blackened by and smelling of powder, unburnt particles of which may be present thereon.

Surroundings : Burnt for 2" diameter : hairs singed, the area smells of, and is blackened by, smoke and unburnt powder. [If a weapon be held *against body*, the skin is burnt, torn and lacerated and the above mentioned characteristic effects produced by flame, smoke and powder will be found internally, along the track of the bullet, there being slight bleeding from wound of exit.]

2. *The wound of Exit :*

(a) If bullet has traversed bone :

Opening—irregular, distorted.

Edges—lacerated.

Size—large.

(b) If bullet has *not* traversed bone :

Opening—circular, regular,

Edges—clean cut, punched out, everted ; tissues are protruding through them.

3. *The Track of bullet :* Every gun-shot wound becomes larger, the deeper it goes. [But punctured wounds become narrower the deeper they go]. Beyond the place where the effects of gases cease, it is a clean-cut tunnel—being lacerated at commencement.

(B) **When caused by small-bore bullets of Modern Rifles—**

1. **IF FIRED FROM A DISTANCE.** (15—20 yards).*

(1) *The wound of Entrance :*

Opening—circular.

* Under such circumstances, it is difficult to assert positively that a wound was caused by a bullet at all.

Edges—cleanly punched out, (there being no bruising) and slightly inverted.

Size—less than that of bullet.

Surroundings—show a small fringe of frayed cuticle.

(2) *The wound of Exit :*

(a) If bullet *has* traversed bone :

Opening—gaping and larger than if it did not so traverse.

Edges—everted, lacerated, through which the lacerated tissues from underneath are protruding.

Size—larger than that of bullet.

(b) If bullet has *not* traversed bone :

Opening—circular ; or flap of skin is everted.

Edges—regular, slightly contused.

Size—larger than that of bullet.

(3) *The track of bullet :* It is a small punched-out tunnel if through soft parts, but a large, regular tunnel, if bone has been smashed ; in any case, it is larger than entrance-wound and slightly increases in size towards exit-side.

(4) *Bone.*

(i) In its shaft (compact tissue) :

(a) Is comminuted into small but very numerous fragments, a central tunnelling occurring.

(b) Broken fragments are driven considerably apart, in lines radiating from the long axis of the bullet-track.

(c) Some of the broken bones are driven into exit-wound, others cause secondary exit-wounds.

(ii) In cancellous extremities :

- (a) A clean tunnel-passage is made.
- (b) Fragments, if any, are not so much separated and dispersed.
- (c) Much bone-dust is found at exit-side.

II. IF FIRED CLOSE TO THE BODY.(1) *The wound of Entrance :*

Opening—triangular, or only a small slit.

Edges—lacerated, flabby, inverted. They exhibit no smell or blackening by powder, nor are particles of powder left on the parts.

(2) *The wound of Exit :*

Opening—larger than size of bullet, cleanly punched out.

Edges—everted, not lacerated, not flabby.

(3) *Track :* punched-out, clean tunnel, bigger than size of bullet.(4) *Bone*—either minutely fractured or if made of compact tissue, is tunnelled through,—fissures in some cases running up and down the bone from the tunnel.(C) **Wounds caused by gun with small shots (shot-guns) :**

1. *Fired from a distance* (4—6 ft.), the shots fly, for a while, as a cohering mass and then scattering, they penetrate the body : some remain lodged, others pass out, making small wounds of exit.
2. *If muzzle be within less than two feet of the body,*—wound of entrance simulates a bullet-wound, internal destructions being severer.
3. *Fired against the body,*—they produce extensive laceration.

Medico-legal Points.

1. **Is it gunshot wound?** The answer is in the affirmative, if you find—(a) either a single contused and lacerated wound (with the projectile lodged in the tissues) or two wounds (one small and inverted—entrance, and the other larger and everted—exit); (b) the wounds exhibit the effects of gas or powder (expansion of tissues) and of flame of powder (fraying); (c) circumstantial or direct evidence. [FALLACIES: (a) A *redhot poker* or a hard circular bamboo thrust in, will simulate a gunshot wound. (b) See Atypical bullet wounds, below.]

2. Gas from **blank fire** has been known to splinter bones into atoms. A person asleep, stupefied or bound, may be killed by a blank charge, fired point blank (say, from under chin or in the mouth) and a murder may resemble a suicide. Similarly, the wind or the grazing of a **flying cannon ball** may kill a man by shock. The presence or absence of shock in a stab or gunshot wound is no evidence for or against penetration.

3. **Bullet injuries.**—In civil life, the *pistol* and *sporting guns* are usually used. If a bullet stays inside the body, it is a potential source of danger, specially so, the nearer it is to an important structure or blood vessel. The bullet is *located* by X-ray and by a modification of the telephone device. Lungs, liver, kidneys, bowels, stomach have been perforated and yet soldiers have not died, provided that they never ate or drank; whereas, extensive internal damages have been noticed with slight external wounds. [*Bore of smooth-bore guns*: Duck gun 8, Fowling piece 12, Snipe shooters 14 to 16]

4. **Recognition of the assailant.**—See p. 58.

5. A bullet fired against head, extensively fractures the skull, and thereafter, expanding in the *brain-substance*, bursts

the skull and smashes up the substance—hence, leaves no definite track. At the wound of entrance, the inner table is extensively broken (hence, the edge of the bone is bevelled internally) and at exit, the outer table is broken (hence, that table is bevelled externally). [The amount of callus thrown out in a bone fractured by gunshot is considerably larger than that by other accidents; and this bulky union of callus mars the use of joints.]

6. **Atypical bullet wounds:** (1) There may be *only one wound*, with no lodged bullet—due to bullet having met a resistant surface and wheeled round it, emerging through the wound of entrance. (2) Bullet grazing against skin may cause a *clean cut* (incised-looking). (3) Conical bullets may produce *dagger-stab-like slits*. (4) A bullet broken into fragments may cause *several slit-like openings*. (5) A bullet distorted by hitting against something hard, will produce an *irregularly-shaped large wound of entrance*. (6) A bullet with spent velocity may produce no actual cut but only a *contusion*.

7. (a) A person hit with clothes on, will get bits of his *cloth singed and driven into the wound*. (b) A bullet may *not injure the clothes* at all but may carry them before it, though with such violence as to have smashed the bone beneath. (c) The *wound of entrance* produced on a DRESS is regular and round and *that of exit*—is an irregular, large tear.

8. The wad put into the gun may get into wound, if fired from a short distance. Examine the wad; it may furnish clue to the murderer. *Presence of wad, points to firing at close quarters* and serious and even *fatal wounds* and fractures have been caused by a hard wadding and large amount of powder, the weapon having been held within 3 or 4 inches of body of victim.

9. **Range of Bullets**—Modern bullets can pass through a man at a distance of about 2000 yds. So far as accuracy and range are concerned, the best effects are produced by breech-loading rifles, shotguns and revolvers.

10. In cases of **suicide**, look for (a) signs of firing at *close quarters*, (b) *blackening* of the finger (index) that pulled the trigger, (c) presence of *fire arms close by* and absence of bullets, (d) the *posture* and *grip* of the deceased and (e) the *portion of the body* struck—its *vital* importance, *easy accessibility* etc. (e.g., inside mouth, over right temple or heart.) Absence of gun near by, does not exclude suicide, for, it may be thrown away by the deceased or by its own recoil. A suicide can *fire both at his head and at his heart*, though each of these is fatal by itself. A suicide rarely fires through an *eye*, though that is fatal too. **Homicides** usually hit *unusual* parts of the body

12. **Blackening of skin**.—(a) If the explosive used is *gun powder*, then it may cause blackening, provided, the flames of explosion have touched the body; the permanence of the blackening will depend on—(i) the distance from which it was fired and (ii) depth of skin penetrated. (b) If the explosive used is derived from *gun-cotton* or *nitro-collulose*, then it will be smokeless and, therefore, would not blacken.

13. **Absence of blackening** is due to (1) Gun powder having been used from *at least over 2 yards distance*. (2) *Gun-cotton* explosive having been used (from near or distance). (3) Wearing of *heavy clothing*; and (4) *Artificial removal* of gun powder smoke-stains. See p. 57. [Not all cases of gun powder fire cause blackening.]

14. **Powder-blackening range**: The greatest distance is 2 ft. from the body. A shot from a pistol will set fire to a piece of paper at 20"; revolvers of $\frac{3}{8}$ " calibre will singe hairs at 4"—6" and blacken it upto $1\frac{1}{2}$ to 2 ft. But it is best to test each firearm, shot and powder for its individual capabilities.

15. In examining a barrel for signs of recent discharge—
 (a) *For about 2 hours after firing*:—look for: *odour* of H_2S , *blackening* of inside of barrel (C , K_2S) '*alkaline*' reaction, solution of the *black residue* which turns lead black. (b) *For between 2 and 24 hours after firing*—look for presence of H_2SO_4 and traces of *rust*; there are no blackening, no 'alkalinity,' no turning of lead into black.

16. **Firing at close quarters** is indicated by—(a) Presence of *wad* in wound. (b) If small *shots* have been fired, they have entered the body *together* (and not in scattered manner). (c) Skin and hair around the entrance-wound is *singed* and *blackened* by powder, unburnt bits of which are ingrained into the tissues locally. (d) Wound of *entrance is large*.

(H) WOUNDS OF REGIONS.

HEAD.

[Never look lightly on any injury of head, however trifling. They get septic inevitably and behind an apparently simple wound, may be a fatal lesion brewing].

1. WOUNDS OF THE SCALP.

Causes :—

1. *Blow* with, or fall of or against, a sharp or blunt object.
2. Machinery or other *accidents*.

Varieties and Characters of injuries :

(1) *Contusion* (with cephal-haematoma, which may be very large in children)—is caused by a blunt weapon. [It may give a false sensation of crepitation, and pulsate too, if a large vessel be near it, thereby simulating a depressed fracture of skull.]

(2) *Contused, lacerated or punctured wound*.—They are *all incised-looking*, whatever their cause or character.

(3) *Incised wound*—is caused by sharp instruments.

Dangers :

Immediate : (1) Sharp hæmorrhage and shock. (2) Skull—fractured (specially, in inner table). (3) Brain—concussed, contused or compressed.

Remote (especially in contused and lacerated wound) : (1) Erysipelas, cellulitis or suppuration. (2) Necrosis of underlying bone. (3) Septic meningitis.

2 THE SKULL :**I. Fracture caused by small striking surface* (e.g., lathi).**

(a) *Size and shape* = those of striking surface.

(b) *Length of fracture* = length of bar that came in actual contact with skull.

(c) *Area fractured* = area actually struck.

(d) (i) If violence is severe—there will be stellate, *depressed*, fracture (depression equalling contact-area of weapon), —the *outer table* breaking in 2 or 3 pieces; the *inner table* in more fragments and spread over larger area.

(ii) With less violence, the fracture will be more *diffused* and *irregular*.

II. Fracture caused by large striking surface : (e.g., crush between two bodies, fall on feet &c.)

I. WHEN SKULL IS 'BILATERALLY' COMPRESSED : (a) It then *gives way* at the point of the greatest tension—usually midway between the points of application of force ; (b) The fracture *extends* between points struck and burst, *starting from* the point of contact of blow, or, from the point opposite.

* IF STRUCK BY THE EDGE OF A HAMMER, the fracture will be semi-lunar. IF 'penetrated' BY DAGGER OR STONE, the fracture will take the shape of the weapon. There will be no concussion. If caused by a FALL ON THE HEAD, the fracture may simulate any of the above.

2. WHEN SKULL IS 'UNILATERALLY' COMPRESSED (as when a man lands on his heels, falling from a height) :—(a) Fracture occurs at point of impact, where the greatest gaping occurs. (b) Line of fracture travels in, and is parallel to, the axis of the blow. It rarely crosses the middle line—but usually disappears near it.

III. Cuts—by sword or other instruments.—These may (a) slice off a portion or (b) may cut into and, at the same time, cause fracture (specially of inner table) of skull.

3. BRAIN-CONCUSSION :

Symptoms :

1. FIRST (COLLAPSE) STAGE :—*Instantaneous* insensibility, lasting from minutes to days ; *collapse* : extremities cold, *pallor* of body-surface ; *Respiration* is sighing, irregular, weak, shallow. *Pulse*—feeble, fluttering, irregular. *Pupils*—variable ; usually contracted, responding to light (except in very bad cases). *Muscles* and *sphincters*—relaxed, but not paralysed. *Conjunctival reflex*—absent. *Other reflexes*—are tardy, but present.

2. SECOND (REACTION) STAGE : Patient can be *roused*. *Vomiting*, epileptiform *convulsion* occur ; followed by *headache*, *drowsiness*, *temperature* rises, and improvement in *heart* and *respiration*.

Prognosis : one of these : (a) Speedy recovery, (b) Meningitis, (c) Encephalitis, (d) Speedy death (which is rare).

P.M. Appearances :—(a) Cerebral anæmia (b) punctiform hæmorrhages throughout brain, with (c) occasional extravasations thereinto ; (d) asphyxial distribution of blood.

4. BRAIN-CONTUSION :

Symptoms : [Often masked by those of concussion, which accompanies it, or of compression, which follows it]. Patient

persistently *lies on one side*, with *knees drawn up*. There are also *restlessness, irritability, apathy, slight fever, delirium, suffused eyes*. If the local lesions are severe,—there are convulsions (tonic and clonic) or paralyses.

Prognosis (1) Death or (2) Slow recovery, with partial loss of memory or of motion or sensation.

P.M. Appearances :—Localised bruising of brain-substance near or opposite to the place struck and at various other parts, with many punctiform hæmorrhages].

5. BRAIN-COMPRESSION :—

Causes : *Immediate* : Depressed fracture of skull, or effusion of blood under dura mater. *Remote* : Inflammation of brain and meninges.

Symptoms :

1. IF CAUSED BY EFFUSED BLOOD.—Instant *senselessness* on receiving blow ; recovery of consciousness with headache, followed again by loss of consciousness, or, may begin with headache, deepening into coma. *Muscles*—are paralysed, at first in localized groups, then generally. *Sphincters*—relaxed. *Reflexes*—are gradually lost : hence, overflow of *urine*, from retention. *Pulse*—is at first full and slow, then weak, quick and irregular. *Respiration* is deep, regular and slow (in moderate cases) ; irregular, stertorous and even of cheyne-stokes type (in bad cases). *Pupils*—at first contracted and then dilated, and do not react to light. *Temperature*—is subnormal, rising later on, during the inflammatory stage, if compression is general ; temperature of opposite side of body is greater by a degree, if compression is localized.

2. IF CAUSED BY DEPRESSED FRACTURE—Immediate unconsciousness and the symptoms attending it.

P. M. appearances : [Note condition of arteries generally]

1. *Scalp*—reveals lacerated wound.
2. *Skull*—fractured (or not); if fractured—bone is depressed into brain-substance.
3. *Clot* is present—(a) sub cranial, (b) sub-dural, (c) sub pial, or (d) into brain substance; and where the clot is—
4. Portion of brain is found to be flattened.

Medico-legal points (head injuries generally) :

1. **Causative factor of injury :** (a) A large wound, without fracture, points to an **oblique blow**; a small wound, with fracture, to **direct violence**. (b) Presence of the following indicates the **use of violence** :—(i) *multiple capillary oozing* of blood (unless there be scurvy, purpura, hæmophilia, gouty kidney, atheroma, etc. to account for it); (ii) *definite or minute hæmorrhages* in a healthy, temperate young man (except in asphyxia neonatorum, whooping cough etc.); (iii) *hæmorrhages into meninges* (except in pachymeningitis hæmorrhagica); (iv) cerebral hæmorrhage + *fractured skull*; or (v) *hæmorrhage into brain substance*, without congestion in other parts of brain, or disease of its blood vessels.

2. Concussion may result from **falls** on buttocks, or on feet or from blow on lower jaw or head.

3. **Prognosis.**—Remember : (a) The SCALP easily gets *septic* and from it, sepsis is easily conveyed inside cranium. (b) SKULL—may be extensively injured in its *inner table*, without any visible external sign; and *trephining* affects prognosis favourably, if done promptly and over the site of largest hæmorrhage (though rarely it proves fatal). (c) BRAIN (i) may be *extensively injured* without being fatal. (ii) After receiving the most trivial assault, without any external signs of violence being

visible on the person, hours or days afterwards, the victim may suddenly die from his cranial vessels giving way, producing compression (result either of—disease like *atheroma*, *syphilis*; or of excitement—*alcoholic* or otherwise). (iii) Concussion may be followed by *compression*. (iv) Compression may be accentuated by diseases present, like *atheroma* of blood-vessels, *cardiac* disease, *condition of cranial bone* as to thinness etc. (v) *Inflammation* of brain does not supervene till a week after accident; hence give guarded prognosis till fourth week. (vi) Removal of *foreign bodies* favourably affects prognosis, though in rare instances, fatalities occur. (vii) Danger to life is in proportion to the *amount of brain tissue destroyed*.

4. Severe injury (meningitis, partial destruction of brain and cranium) (a) may end in **recovery**, as in the American crow-bar accident case (1848); (b) may *not* always produce *immediate* insensibility; a blow, not leaving any mark, may, on the contrary, cause unconsciousness.

5. **Hæmorrhage** is **arrested spontaneously** by (a) fall of blood-pressure, consequent on loss of consciousness; (b) blood clotting around the broken vessels; or (c) other mechanical means. It is usually *re-effused*, owing to subsequent excitement or reaction. (b) Hence, there is no knowing as to the period it takes **meningeal hæmorrhage** to be fatal. It is **due to**—(a) **LOCAL INJURY**—if the hæmorrhage is (i) on the *surface* of brain; (ii) *remote from the seat of injury*; (iii) *below the point on the skull struck*; or (iv) on a part *opposite*; (iv) *two extravasations* exist as the result of *one blow*. (b) **DISEASE OR EXCITEMENT**—if (i) *age is over 40 years*; (ii) *arteries are diseased*; (iii) *cerebral vessels are congested*; (iv) *the effusion is into the substance of the brain*; and (v) *there are no superficial local signs of injury*. [Always remember **Apoplexy**].

6. **Clots inside skull**, when fresh, **change colour**, after 12

to 25 days, in succession, into chocolate, brown and ochre. With age, they get firmer, disposed in fibro-membranous layers and adherent to dura and brain, where they leave a scar. Brain cells once destroyed are gone for ever, the destroyed parts being got rid of by inflammation.

7. **Capability for work.**—A man stunned by a blow on the head, will, if he has got—(a) *Meningeal hæmorrhage*—recover consciousness, and perform acts of volition; (b) *Cerebral hæmorrhage*—will not do so.

8. **Life and activity** are compatible even with extensive damages to brain, irrespective of the seats of lesion. Injuries direct to *medulla* and *central basal ganglia of brain* are however rapidly fatal. [Hence, give guarded opinion, as to duration of life after receiving a severe wound of brain.]

9. *Slight unilateral injuries* to brain may not rob consciousness. A modern rifle bullet fired with nitro powders causes much disorganization of tissue around the original track of the missile and jeopardises life. Death from gunshot wounds of brain is attended by signs of excitement of genitals.

10. **Fractures :** (a) AMOUNT OF VIOLENCE NECESSARY TO fracture skull depends on (i) thickness and (ii) the quality of the skull-bone : the thinner the bone, the severer the fracture. At certain places (*base*), in certain *diseases* (*fragilitas ossium*, *sypilis* etc.) and in *old age*, specially in the *female*, the skull is more easily fractured. At every site of injury, measure the thickness of skull. (b) CAN FALL ON LEVEL GROUND FRACTURE THE SKULL? No, unless the bone is abnormally thin and brittle. (c) WITHOUT ANY EXTERNAL SIGN OF INJURY *being visible*, there may occur—(i) fracture of skull (specially the *inner table*), (ii) separation of *sutures*, even in the aged, (iii) *compression* of brain; (iv) fracture of *base* of skull, from falling from a height on his heels or buttocks or from receiving

a hard blow on his chin. (d) 'LATHI' BLOW ON A TURBAN-ED HEAD OR HEAD FULL OF LONG HAIR—causes injuries resembling those caused by weapons of 'large' striking surface, and usually simple instead of compound fractures.

8. Sequelae of head injuries : aphasia, epilepsy, diabetes, mental derangements, paralyses. The length of time required for the appearance of these symptoms varies indefinitely.

9. Direct penetrating wounds **into orbit** result in stellate fractures of skull, specially in the young. This plate of bone is very thin.

FACE.

Causes : (a) *Sexual jealousy*—leading to slitting off of nose, of ears, of lips, or to gouging of the eyes. (b) *Theft or violence*—resulting in tearing ears or nose by pulling off their ornaments, knocking off the teeth &c. (c) *Self-defence*—by biting off nose, ears, cheek &c. of assailant.

Medico-legally, many of these come to be '*grievous hurt*'. [In case of teeth, examine the teeth presented, as well as the victim's tooth-socket.] As a rule, face-injuries are (a) *not dangerous to life*, unless they penetrate the brain or cause inflammation to travel up to it, via sense-organ-cavities ; (b) are liable to get *erysepeletous* ; (c) *heal* quicker and (d) cause *disproportionately diffuse bruises*.

1. EYE-BROWS.—Wounds of them may **result in**—(a) amaurosis, (b) supraorbital neuralgia, (c) bad deformities, (d) spreading inflammation, ultimately reaching brain.

2. TONGUE may get cut or punctured and it is possible to get *complete union*, under prompt aseptic surgical treatment. *Bleeding* that is secondary or due to injury to posterior part, requires ligation of the lingual artery.

3. THE EARS.

1. **External Ears**—may be *cut or torn off* without any loss of hearing resulting.
2. **Drum**—may be *ruptured* by (a) blow or box on the ear, (b) concussion caused by firing a cannon, (c) by violent syringing of the meatus. Ruptures unite and defective hearing is curable.
3. **Labyrinth**.—may be injured by blow on head or ear.
4. **Feigned deafness**.—Test with tuning fork and keep patient under observation. [See Chap. XII.]

4. THE EYES.—The injuries are :

(a) **Loss of sight**—CAUSED BY (i) blows on the *head* (which may rupture the eye-ball) ; (ii) contusion or contused wounds of *eyebrows* : these do not produce visible changes in the eyes ; (iii) prolonged exposure to direct *glare* of sun as reflected upon snow or to the noon-day sun or to powerful electric arc light ; or (iv) impaction of foreign bodies in *eye* or injury thereto.

[If **Feigned**.—Use prism test.—See Chapter XII.]

(b) **Luxation forwards of eyeball**,—*produced* by blow on, thrust into, or fall on, projecting substances or by violently sneezing, or blowing the nose, &c.

(c) **Orbital cellulitis**—from penetrating thrusts into eyes, which may lacerate brain, rip open cerebral vessels, or cause fatal meningitis.

(a) **Gouging the Eyes**—by fingers or other pointed instruments or hot probes,—out of sexual jealousy. [Cautions.—(i) *Birds of prey* first feed on the eyes and gouge them out, when they sit on a corpse. (ii) An eye may be exteriorly *injured without damage to vision*. *Blind eyes may look outwardly natural* and yet may not see, owing to deep-seated diseases (syphilitic &c.) (e) **HEMERALOPIA** or night-blindness is a sign of

retinitis pigmentosa or of denutrition ; NYCTALOPIA is a state of bettered vision.]

5. **THE NOSE.**—is *cut off* as a punishment for infidelity and *bitten off* in quarrels. Extensive *contusion* of nose *may lead to* loss of sense of smell, and, if severe, may cause spreading inflammation, reaching up to brain. Brain can be punctured through nostrils without leaving external marks. By surgical operations, it is possible to *mend nasal defects* and deformities. [Taliacotian, Syme's, Wood's operation &c.]

THE NECK. (CUT-THROAT.)

Suicidal.

vs.

Homicidal

1. Cut *standing*—., streaks of blood occur *on front*.

2. Usually *single*, if severe ; or, one severe and a few parallel, superficial ones.

3. Cut is at *high level*—over thyro-hyoid membrane or hyoid bone or cricoid cartilage.

4. *Direction* : transverse or upwards from left to right

5. *Commencement* deepest and regular ; *rest of it*, superficial and, perhaps, irregular ; *termination* in a sharp angle, or tailing off or bifurcating—more on right than on left side.

6. *Instantaneous cadaveric rigidity* is present.

7. Signs of *struggle* or *cuts* on palm and fingers or of bruises and finger-nail-dents on mouth—nil.

8. Large vessels of neck

1. Victim lay *recumbent*.

2. *Multiple* wounds, in *directions different* from principal wound, and *all very severe* [If single, also very severe.]

3. Usually, the cut is *low* down on the neck.

4. *Direction* is *horizontal* ; it may be obliquely downwards from left to right (if victim is murdered from bed-head) ; obliquely downwards from right to left (if murderer cut standing in front.)

5. The wound is always *very deep throughout*, cutting down to or across spine ; and *prolonged* below and behind—"under-cut."

6. Instantaneous R. M. is absent.

7. Signs of *struggle*, *cuts* on palms and fingers and bruises on mouth are present.

Suicidal

vs.

Homicidal

often escape injury, specially those of *one* side.

9. Wound is *regular* and incised.

8. Large vessels on *both* sides of neck do not escape.

9. Wound probably *irregular*.

Medico-legal Points :

1. **Capacity.**—Division of *common* carotid is often speedily fatal; that of *external* carotid is not so speedily fatal; yet, with a fatal cut of common carotid (with branches) and of internal jugular vein, a person may be able to walk some distance and do other pieces of voluntary act.

2. Homicide vs. Suicide :—

(a) Neither the *regularity*, the *extent* and *depth* of the cut, nor the fact of the throat-cut being *incised*, nor even the *direction* taken by the cut, can point unequivocally to suicide or homicide.

(b) Never depose positively, but rather depose to the possibility of a wound being homicidal or suicidal. In **SUICIDE**, the *greater length* of the wound is usually *on the side on which the cut began*. [Examine *position* of victim's hands, his fingers and finger-nails and look for spirts of blood thereon; if they are on one *aspect* of the limb only, guess therefrom the manner of use of the hands.]

(c) The skin of neck being loose, both ends of incised wounds may **APPEAR SERRATED**,—minute ones at commencement and rougher ones at termination. These serrations disappear, if the victim lives over 48 hours. It may be possible, from a consideration of them, to say in some cases, whence a wound commenced and whereat it ended, and thereby infer (i) the direction of delivery of assault, (ii) the hand used by the assailant and (iii) his relative position.

(d) Multiple deep cuts on different parts of the body or too close over one spot are caused by **LUNATICS** or **HOMICIDES**.

3. **Dangers** in cuts of throat are : *Immediate* : shock, sudden profuse hæmorrhage, asphyxia (from oozing of blood from small superficial veins into the wind-pipe). *Remote* : oedema glottidis, bronchitis, broncho-pneumonia, surgical emphysema, cellulitis extending into mediastinum. Cuts above hyoid, below thyroid, on the sides, cuts dividing gullet or low down on the neck—are all dangerous.

4. **Other wounds**—(a) A PENETRATING wound of neck may divide any blood vessel and at the same time stop it too, its withdrawal thereafter resulting in fatal bleeding. (b) The soft parts in front of neck may be fatally CRUSHED without dividing skin.

5. At the moment a man's wind pipe is cut, he *cannot* use his **voice** ; hence a murder may be *quietly* effected ; but—(a) A man with his wind-pipe completely divided *below* vocal cords (if his recurrent laryngeal nerve is in tact), can cry and whisper, head bent. (b) *Voice* (sound) is retained but *speech* is lost, if wound is *above* vocal cords, because, the mouth only modulates sounds and active hæmorrhage is a disturbing factor in articulate, audible speech.

THE CHEST.

1. **CHEST-WALL.** [Recovery after extensive and apparently fatal wounds, even involving lungs, is possible.]

1. **Incised and Punctured** wounds are not dangerous per se, unless neglected.

2. **Contusion or Contused wound**—*if severe*, may be followed by instantaneous death, (without any detectable lesion of viscera) from pressure on heart, vagus or sympathetic—sudden cerebral anæmia. *If slight*, hæmatoma forms and may suppurate. *Its danger* is in proportion to the violence used, being often accompanied by fractures of ribs, rupture of viscera hæmorrhage, inflammation or suppuration.

3. **Penetrating wounds** (beyond pleura) are fatal—*immediately* from hæmorrhage; and—*remotely*, from inflammation. A wound completely transfixing chest, is less dangerous than a simple penetrating wound.

2. FRACTURE OF RIBS.

Causes : *Direct violence* :—kicks, blows, falling of loads, *Indirect violence* :—(a) fall, (b) squeeze between buffers or under foot, bamboo, or knee-elbow. **Commonest Site** : 5th—8th ribs. **Dangers** : [Lower ribs being yielding and 1st and 2nd ribs being protected, escape]. Laceration of *lungs* or *pleura*; wound to *heart*, *pericardium*; laceration of *big blood vessels* (hæmorrhage).

Special points : 1. Fractures are common in *old age*.

2. *Direct violence*—breaks a rib at *one* point, the broken ends being driven *inwards*. [There is no fracture on opposite side by *contre coup*].

3. *Indirect violence*—breaks a rib (a) either at point of *greatest convexity* or (b) in *two* places (one in front, and the other behind), and the broken ends are driven *outwards*.

4. *Antero-posterior compression of chest*-- often causes bilateral (often symmetrical) fracture.

5. There may occur symmetrical fracture of ribs *without* (a) any *external marks* of injury or (b) injury to any *internal organ*.

3. **FRACTURE OF STERNUM** :—It really is a dislocation between first and second pieces. **Cause** : Associated with fracture of ribs or spine; also caused by forcibly impacting chin against it. **Dangerous** if bone is depressed, from injury to viscera or vessels or suppuration in anterior mediastinum.

4. (a) HEART, THORACIC DUCT, BIG VESSELS :

Penetrating wound :—Usually fatal, though *recoveries* are on record. A heart wound is *fatal instantly*, if it involves (a) the

important structures at its base (specially, coronary artery) ; (b) the nervous mechanism of it (causing shock). It is *remotely* fatal from—pericarditis, endocarditis, empyema etc. [Injury to its *muscle*-substance is neither quickly fatal nor productive of much bleeding.] *Hæmorrhage is slight, if—*(a) puncture has entered ventricle rather than auricle ; (b) the wound to the heart is small or oblique ; and (c) the injury to the blood vessels is a puncture and not a cut. **Regarding capacity**,—men with bad wound of heart have been known to—(a) Live for hours ; (b) Perform various responsible functions without feeling any discomfort ; (c) Run, cry out loudly, show sufficient strength ; (d) Walk one mile.

(b) **RUPTURE OF HEART** : [Even the healthy heart has been known to rupture from apparently trivial violence and without external marks of injury. Wounds of heart have been *successfully operated on*]

Causes : (1) *Violence* (direct or indirect) *over cardiac area* (with or without fracture of ribs or sternum) specially if—(a) delivered over its 'apex' (b) just before its systole (c) when stomach is full. (2) *Diseased condition of heart*, e g., (a) fatty or fibrous degeneration (b) chronic myocarditis (c) atheroma of coronary vessels.

Site of rupture—Left ventricle (*if spontaneous*) ; right ventricle (*if traumatic*).

5. **PLEURA AND LUNGS**. **Nature of injuries and Dangers** : (1) *Penetrating wounds*. (2) *Rupture of lungs* complicated with—hernia of lungs, emphysema, pneumothorax, pleurisy, pyothorax, hæmoptysis, abscess or gangrene of lungs. 3. *Crush of phrenic nerve* (∴ instantaneous death.)

Medico-legal points :

1. Lungs, heart and diaphragm may each or together be ruptured by external violence, without fracture of ribs.

2. A ball may *completely penetrate*, or an arm may *completely transfix*, the chest, without either being fatal or incompatible with giving out of distinct commands.

3. *Spontaneous* rupture of lungs may take place from violent coughs or even deep inspiration.

6. DIAPHRAGM. Nature of Wounds: 1. *Stab*

2. *Gunshot*. 3. *Rupture* from (a) severe straining (vomiting, extraordinary eating &c.), (b) fall or blow on abdomen or chest, (c) severe squeeze of abdomen or chest. **Dangers:**

1. Hernia and strangulation. 2. Spasmodic contraction.

Medico-legal points:

1. Wounds to *tendinous* parts are more dangerous than those to fleshy parts of diaphragm.

2. Rupture is not speedily or instantly *fatal*, though with a rupture, a man may walk some distance, and live for weeks.

3. As the result of external violence, diaphragm may be lacerated, without there being any fracture of the ribs.

ABDOMEN.

[**Caution.**—Recoveries are on record after severe injury with considerable loss of substance of vital organs. In no case, are external appearances a true index to the extent of internal mischief, and there may be fatal injuries to abdominal viscera, without any external visible marks].

Symptoms of abdominal injury.—(1) **PAIN**—severe and radiating or localized; neither its seat nor its intensity is of any prognostic or symptomatic value. (2) **SHOCK**=anxious expression of face, restlessness, cold, clammy sweat, frequent and feeble pulse, shallow respiration, low temperature. If shock is *transient* (even though profound), probably there is no injury to a viscus. If shock is *persistent or relapsing*, though perhaps at first delayed, it points

to serious visceral mischief. Injury to peritoneum determines the gravity of a case (3) **VOMITING** and great *thirst*.—If vomiting is persistent=visceral complication; if bloody=lesion in upper part of gastro-intestinal tract (4) **LOCALIZED SWELLING** in some cases

1. CONTUSION.—Its extent—(a) Simple bruising, (b) considerable extravasation of blood, (c) rupture or pulpification of abdominal wall-muscles. Its dangers :—(a) Laceration of peritoneum; (b) Rupture of viscera; (c) Hernia and its strangulation; (d) Injury to blood-vessels; (e) Injury to solar plexus, with attendant shock; (f) Gangrene of bowels from thrombosis of mesenteric vessels, following lesion of omentum and mesentery. [(a) There may be fatal injury to internal organ without any visible marks on external abdominal wall; (b) and there may be 'bruise'-like marks on abdominal walls, without any violence having been offered thereto. (*vide p. 124*)].

2. RUPTURE OF VISCERA—from blows, falls or being run over. [Unless there is immediate and profuse hæmorrhage, it does not prevent a person from exercising muscular power or surviving long. Rupture may easily occur p. m., when putrefaction is much advanced.*

(a) **Spleen**—is naturally *friable*, the more so, when enlarged and diseased, in which case, it may rupture *spontaneously*, or even from the effects of ordinary rubbing over the area. When ruptured by blows, there may be no external marks, a rupture being fatal from hæmorrhage. *Site of rupture*—mostly the inner surface.

(b) **Liver.**—Naturally, it is very *friable*; its superficial position, big size, and immobility render it liable to injury. Injuries to it are fatal *immediately*, from hæmorrhage, *later on* from abscess, jaundice etc.; its rupture is longitudinal, and is *due to* fall, kick, stab etc. Recovery is known after small ruptures; and, as bleeding is not at first copious, victim may *survive long* and *walk* some distance.

(c) **Intestines.**—The *commonest site* of rupture is where jejunum joins duodenum. Intestines being long, do not rupture when empty and collapsed. *Death*, when it occurs, does so from shock or peritonitis. *Causes*: local violence (kicks, crushes); diseased condition. Violence need leave no external marks. *Capacity*.—After fatal injury, an individual may be capable of considerable muscular exertion.

(d) **Stomach.**—*Causes*: its distended condition, plus violent ineffectual vomits or external violence (with or without visible marks). *Death is due to*—peritonitis.

(e) **Gall Bladder.**—Death is due to shock and peritonitis. *Cause*: strong emetics, violence delivered locally.

(f) **Urinary Bladder.** *Causes*: spontaneously, during over-distension (from paralysis); giving in of former scar or stricture; pressure over it of foetal head; local violence (fall, kick, crush etc.). *Death is due to* shock, peritonitis, cellulitis. *Capacity*:—A man with ruptured bladder can walk a good distance. *Recovery* after rupture is also possible. Bladder may be INJURED by passage of weapon through anus, vagina or small sacrosciatic notch (buttocks). [As a rule, urethra gives way before the bladder does. In a man drunk, there is greater production of urine, lessened sensibility and constant tendency to fall prone.]

(g) **Kidneys.**—*Due to*—pressure of child's head, over-distension in diseased condition (rare), fall, blow. *Fatal from*: shock, extravasation, uræmia, peritonitis (rarely). One kidney may be injured irreparably, without fatal issue following. Rupture from external violence is usually attended with *visible lesions outwardly*.

(h) **Gravid Uterus.**—*Fatal from*: separation of placenta (hæmorrhage and shock). *Causes*: spontaneously during

protracted labour ; severe local violence. [Sometimes severe local violence fails to injure uterus]. Its stretched *ligaments* also may be torn. Uterus may be *injured* per vaginum in attempts at abortion or punishment by thrusting sticks in. **Non-gravid** uterus ruptures from severe local violence. In rupture of **fallopian tube** or **ovary**, search for embryo (extra-uterine).

(i) **Rectum**—is injured by acts of *sodomy*, thrusts of *sticks* or of *irritating twigs*. Death results from sloughing. Note that in decomposed bodies, rectum normally protrudes.

Medico-legal Points :—

1. A fatal blow on the abdomen without any external marks, may present (i) no internal p.m. appearances,—if death is from inhibition of heart ; or (ii) rupture of viscera,—if the victim's abdomen was suddenly taken unawares.

2. If a man is well developed and is *prepared* to receive a blow on his *anterior abdominal wall*, he may be struck thereon with considerable force, without any ill effects.

3. If a man is *dressed*, even the passage of the wheels of a cart over his abdomen may leave *no external marks*.

4. Blood may be found *extravasated* into the tissues of the abdominal wall, without violence being its cause. (p. 124).

5. From delay in onset of shock, or from slowness of initial shock, it is possible for a man with injury to his abdominal viscus to *exercise considerable muscular power*, provided, there is no sudden loss of blood.

6. In cases of visceral injuries, mortality is often greater, the longer *operation is delayed*.

7. In treating cases of abdominal injury, *it is dangerous to allow drinks* or local fomentation and brandy and pituitary gland extract should be given cautiously, if at all.

8. Edges of gun-shot wounds sometimes slough and cause *secondary perforations*.

9. In wounds of lumbar region, *foeces may escape* from colon, without involvement of peritoneum.

SPINE.

1. **SPRAINS**=stretching or rupture of back-muscles, ligaments, fasciæ, with or without crushing of bodies of spine. **Caused by**—Twist or bend of neck. **Complicated by** (a) concussion of spine; (b) inflammation of intervertebral joints; (c) vertebral caries; (d) laceration of cord; (e) renal injury. **Simulated by**—a dislocation of it.

2. **WOUNDS & STABS of cord and membranes.** **Dangers:** (a) Death occurs from *decapitation* or *meningitis* (spinal); (b) *paraplegia*, if there is complete division of spinal cord, in dorsal region.

3. **CONCUSSION** [=“Railway Spine”]=injury to cord, without fracture of spine. **Symptoms:** [*Onset:* immediate (hæmorrhage) or insidious (inflammatory effusion followed by softening.)] (a) *Limb muscles*—weak, even paralysed, or excitomotor spasms occur; wasting (b) *Paræsthesiæ*, formicating, ‘bitten’ and other curious sensations. (c) *Urine*—not voided easily. (d) *Vision, hearing and general nutrition*,—may be affected. (e) *Mental* weakness or derangement, sleeplessness, headache, *irritability* of temper. **Diagnosis.**—If the case has taken some time to progress, it may be *genuine*; if only some days, it is probably a *false* one. **Prognosis** is doubtful. **Autopsy** may reveal *no traces of injury*.

Medico-legal points:

It is not easy to concuss the cord by *slight* violence. *Blows on spine* (without fracture or dislocation) may lead to inflammation and softening of spinal marrow. The symptoms being

subjective, may be *simulated* or *exaggerated*. To detect simulation, use X-ray ; look for wasting, electrical reaction.

4. FRACTURE-DISLOCATION : COMPRESSION.

Causes : (1) Fall from height on top of head (2) Judicial hanging. (3) Diseases of spinal bones or ligaments. (4) Violence, with or without visible external marks (like wrenching, or hammering). **Complications :** pulmonary congestion, urinary inflammation, sloughing. **Prognosis :—**Danger is in proportion to the amount of cord injured and nearness of injury-seat to the medulla. In the **Cervical** region, death is instantaneous, in injuries above 3rd cervical vertebra ; or within a few hours, lower down. **Upper Dorsal.**—Patient survives 2—3 weeks. **Lower Dorsal.**—Patient may recover and get paraplegia. Death from complications in 1 or 2 weeks. **Lumbar**—usually recovers.

Medico-legal points :

1. As there is a considerable space between spinal marrow and arch, fractures, dislocations and effusions^t need not press on marrow, unless *considerable* ; but when they do press, fracture-dislocations disable the victim *instantly*.

2. With the neck slightly bent forward, a sharp-pointed instrument may be easily introduced into spinal cavity to cause instantaneous death, if inserted above 3rd cervical vertebra. Drawn out obliquely, it may leave only a pointed scar.

3. A splinter of fracture, inside spinal canal, may without previous symptoms, cause sudden death in the act of turning the head in any direction. Similarly, compression of cord may result from effusions from inflammation, diseases, accidents or injuries to head or spine. Sudden death may follow such causes, which cannot thereafter be easily understood.

FRACTURES OF BONES.

Fatal—if of those of spine or skull.

Frangibility of Bones increases in—(1) *Constitutional* diseases—syphilis, rickets. (2) *Conditions associated with trophic changes*—e.g. pregnancy, (mollities ossium), ostiomalacia, old age (cancer) 'general paralysis of the insane,' locomotor ataxy ('fragilitas ossium').

Spontaneous fracture may occur from sudden and severe muscular exertion, in strong muscular individuals (as in throwing something or kicking &c.)

Age of a Fracture is guessed from pathological process, *viz.*

1. DURING 1ST WEEK, effused blood is changing color, granulations forming along bruised and lacerated soft tissues.

2. DURING 2ND WEEK, effusion is being absorbed and soft granulation tissue (callus) forming. Amount of callus is greater, if rest of the part has been less. If bones are kept immovable, or are impacted, provisional callus may not form. This callus always forms in ribs.

3. DURING 3RD WEEK, callus is fibrous.

4. DURING 4TH WEEK, callus is ossifying. Dark coagula of blood may be found beneath superficial fascia for four weeks or more after the accident.

Ante Mortem Vs. Post Mortem Fracture : After death, it is difficult to fracture a bone, as the tissues have then lost their tonicity and elasticity. *Ante mortem* fracture shows signs of vital reactions : extravasation, bruise, lacerations ; *post mortem*, none of these.

EXTERNAL GENITALS.

A. MALE.

1. **Penis or Urethra** :—*Injuries* : amputated (wholly or partially), or avulsed or bruised (by kick &c.) or lacerated.

Effects : (1) Retention or extravasation of urine ; (2)

hæmorrhage ; (3) shock ; (4) sloughing, abscess, sepsis ; (5) stricture or fistula. A complete rupture is more dangerous than a partial one.

2. **Testicles** : *Injuries* : squeezed (bruised) or avulsed.

Results : shock, hæmorrhage, orchitis.

3. **Scrotum** : Injury may cause sloughing.

Medico-legal points :—

(a) Testicles and scrotum may be avulsed without causing death or destroying sexual powers and instincts.

(b) Squeezing or slitting off of testicles and penis are modes of punishment for adultery. Insane people may cut off their genitals and eunuchs were thus prepared for the harem

B. FEMALE.

A direct blow on the vulva produces an **incised-looking** wound which bleeds freely. Wounds are **fatal from** hæmorrhage, cellulitis and gangrene. Deaths from *hæmorrhage* have occurred from—(1) Small punctured wounds. (2) Kicks on vulvæ. (3) Thrusting sticks into vagina, after rape. (4) Unequal sexual intercourse. (5) Spontaneous rupture of distended vein in labia (during pregnancy or from tumours.)

CHAPTER VIII.

TOXICOLOGY or POISONING.

(A) GENERAL INTRODUCTION.

Definition.—Anything that, when taken into the body or absorbed, causes (*a*) *local* injury, or (*b*) injury to the body *generally*, or (*c*) death, is a **poison**. **Toxicology** is the science of poisons, describing (1) their *nature* and *constitution*, (2) the *symptoms* and (3) *postmortem appearances* they produce, (4) the *treatment* proper to them and (5) the *chemical tests* whereby to detect them.

Classification of Poisons : I. *According to their nature :* Corrosives, Irritants, Narcotics (acting on brain), Neurotics (including cardiac)—acting on spinal cord.

II. *According to Source :* Mineral, Vegetable, Animal.

III. *According to their actions :* Acute, Sub-acute, Chronic.

Evidence of Acute Poisoning is gathered from a totality of these :—

I. **Symptoms**—which (*a*) come on *suddenly*, *after taking food, drink or medicine* ; (*b*) *progress rapidly and steadily* ; (*c*) begin *in sound health* ; (*d*) are *uniform*,—*in all individuals* who have swallowed it, and, (*e*) are *in their character* familiar to us as those of a particular poison. [FALLACIES : (1) A poison may be absorbed *intermittently*. (2) Poison may not have been taken with food but given *per rectum, vagina &c.* (3) In chronic cases, as well as during sleep and intoxication, onset of symptoms is *delayed*. (4) Onset of apoplexy and cholera is

sudden too. (5) Another (counteracting) poison taken simultaneously may *modify its action*. (6) A man in ill health may also get poisoned.]

2. **Attack of (a) several persons simultaneously** with *similar symptoms*, and after partaking identical food ; or (b) of same individual, on each occasion of his food having passed through the same hands. [FALLACIES : (1) Cholera also attacks several persons eating the same food. (2) In a feast, every person may not take all the dishes—hence, some escape poisoning thereby.]

3. **Experiments on animals**, by feeding them—(a) on *suspected* food-matter, or vomitted-matter, or poisons eliminated and (2) on poison *supposed* to have been taken, and then *comparing the symptoms* in the animal with those in the victim.

4. **Postmortem examination**,—leading to (a) evolution of *characteristic smell* of poisons (HCN, CHCl_3 , carbolic acid), (b) *finding of poison* inside stomach (dhatura seed, opium etc.) (c) discovery of *erosion, congestion or ulceration* of gastric mucosa and signs of *irritation in air passages &c.*

5. **Chemical analysis of viscera** and their contents.

Diseases simulating Poisoning : IRRITANTS : colic, intestinal obstruction, intussusception, peritonitis, strangulated hernia, gastritis, gastrointestinal catarrh, ruptured gastric ulcer, cholera. NARCOTICS : Apoplexy, heart disease, epilepsy, coma, swooning from any cause, acute yellow atrophy of the liver. NEUROTICS : Meningitis, tetanus, convulsion (in children.)

Diagnosis of Acute Poisoning from main symptoms.—If you find that the patient is—

Vomiting : *Asphyxiants, Irritants, Corrosives, Food Poisoning.* Akanda, Arsenic (*rice-water like or bloody*) Calabar bean, Carbolic acid (*smell*), Cantharides (*shiny particles*), Coccus Indicis, Colchi-

cum, Colocynth, Copper or arsenite of copper, Digitalis, Fungi, Lead (*coagulated*) Marking nut, Mercury (*stringy*) Phosphorus (*green or black and luminous in dark*) Pilocarpine, Santonine, Permanganate (*bluish or greenish*), Iodine (*yellow, blue or black*), Sulphate of indigo (*blue*) **Pupils**—See *infra.*, p. 168

Purging (serous or bloody)—*irritants, corrosives* (See Chap. on Irritants) [*Greenish*—in copper]

Salivating : *Alkalies*. Antimony, Arsenic, Bismuth, Cantharides, Carbolic acid, Chromium, Colchicum, Copper, Croton oil, Digitalis, Ergot, Gold, Hydrocyanic acid, Iodine, Jaborandi, Lead, Mercury, Muscarine, Nitrobenzene, Pilocarpine, Tobacco, Veratrine. [Opium, Sulphuric Acid—rarely].

Collapsed (=excessive *pain* or loss of fluid) :—*Irritants, corrosives*. Aconite, Alcohol, Antimony, Coal-tar derivatives, Delphinine, Digitalis, Oleander, Snake-poisoning, Tobacco.

Temperature is raised : Belladonna, Cocaine, Iodine, Iodoform, Dhatura, Food poisoning, Phosphorus.

Cyanosed : *Corrosives*. Carbolic acid, Carbonic gas. Coal-tar derivatives, Opium, Hydrocyanic acid, Nitrites, Silver nitrate, Snake-poison, Strychnine.

Skin rash : ERYTHEMATOUS or SCARLATIFORM : Belladonna, Stramonium (*followed by desquamation*), Chloral (*first on hand, thence along greater nerve-tracks*), Salicylic acid (*with oedema of eye-lids*). Quinine (*with itching and tingling*), Arsenic (*also eczematous*), Antipyrine, Arnica, Croton oil, Copaiba. ACNEIFORM : Iodides, Bromides (*first on face and back ; may run on to boils or ulcers*), Codliver oil. PUSTULAR : Antimony (*varioloïd*), Iodides (*first appear as papules*). URTICARIAL : Antipyrine (*first on inside of thigh*), Copaiba (*first on hands*), Salicylates, Cubebs, Opium, Quinine, Valerian, Santonine, Turpentine. PURPURIC : Copaiba, Chlorate of potash, Belladonna, Ergot, Chloral, Chloroform, Iodides, Mercury, Quinine. ERYSEPELATOID : Bromides, Boric acid, Iodides, Iodoform, Quinine.

Jaundiced : Antimony, Chloroform, Copper, Mercury, Phosphorus, Quinine, Snake-poison.

Comatose : *Hypnotics* (chloral, veronal etc), Alcohol, Belladonna, Camphor, Chloroform, Copper, Carbon monoxide or dioxide, Opium, Dhatura, Cannabis Indica. Sulphuretted hydrogen.

Delirious : Alcohol, Belladonna, Camphor, Cannabis Indica, Conium, Coccus Indicus, Dhatura, Fungus, Hyoscyamus, Opium, Phosphorus, Stramonium.

Tetanized : *Whenever there is agonizing pain or asphyxia.* Akanda, Antimony, Arsenic, Benzine, Brucine, Camphor, Cinchonine, Codeine, CO₂, Ergotin, Food poisoning, Hydrocyanic acid, Lead (*only abdomen rigid and retracted*), Oleander, Oxalic acid, Picrotoxin, Salines, Strychnine, Thebaine, Tobacco, Veratrine.

Paralyzed : Aconite, Arsenic, Calabar bean, Coccus Indicus, Conium (*ptosis*), Gelsemium (*jaw-drop, ptosis*), Iodoform, Lead, Snake-poison (*tongue esp.*), Curare, Staphysagrine, Salines (*paresis*).

Having Cramps : *Gastro-intestinal irritants.* Arsenic, Ergotism, Lead, Tartar emetic.

Having tingling : Aconite (*tongue*), Veratrine (*extremities*).

Urine is bloody : Alcohol, Arsenic, Cantharides, Turpentine, Iodine, Phosphorus, Carbolic acid, Salicylates.

Urine is of dark Port-wine colour : Carbolic acid, Salicylic acid, Sulphonal, Tetronal, Trional [Beet-root, Hæmatoxylin, Prickly pear, Rhei, Strawberry, Senna, Sorrel,].

Urine Contains hæmoglobin : Arsenuretted hydrogen, Chlorates, H, H₂S, HCl, H₂SO₄, Carbolic acid, Nitrobenzol, Naphthol, Pyrogallol Acid.

Dysuria, Strangury : Belladonna, Cantharides, Digitalis, Turpentine.

Smell in Breath : Acetic acid, Alcohol, Ammonia, Carbolic acid, Kerosene oil, Phosphorus, Laudanum, Prussic acid, Turpentine.

Sweating profusely—Aconite, Antimony, Pilocarpine, Opium. See "Collapsed," p. 165.

TABLE OF CHIEF ACTION OF ALKALOIDS.

		<i>Stimulated by</i>	<i>Depressed by</i>
Motor.	<i>Nerve endings</i>	Pilocarpine [Morphine, Nicotine]	Atropine, Conine, Cocaine, Methylalkaloids, Sparteine.
	<i>Spinal cord</i>	Brucine, Strychnine, Thebaine [Morphine]	Apomorphine, Cocaine (very large dose) Eserine, Emetine, Veratrine.
	<i>Brain</i>	Atropine, Cocaine Eserine.	
Sensory.	<i>Nerve endings</i> [Nicotine, Veratrine].		Aconitine, Atropine, Morphine, Cocaine, Veratrine.
	<i>Brain</i>	Atropine, Caffeine, Cocaine, Hyoscyamine [Morphine].	Cannabin, Lupulin, Hyoscine [Morphine].
Secretory.		{ Eserine, Nicotine, Pilocarpine [Morphine].	Atropine, Morphine, Muscarine, Quinine, Strychnine.
Vagal.	<i>Cardiac</i>	Aconite, Delphinine, Nicotine, Veratrine [Atropine, Hyoscyamine].	The same in large doses.
	<i>Respiratory</i>	Apomorphine, Strychnine.	Caffeine, Codeine, Conine, Emetine, Eserine, Quinine.
Vomiting.		Apomorphine, Curarine.	Morphine.
Heart accelerating		Caffeine, Delphinine.	

Vaso motor.	Strychnine [Atropine, Veratrine].	Aconitine, Emetine, Lobeline, Nicotine, [Atropine, Veratrine].
Muscular work.	Caffeine.	Apomorphine, Cocaine, Emetine. Quinine.
Pupils (3rd Nerve)	Nicotine, Pilocarpine.	Aconitine, Atropine, Conine, Gelsemine, Muscarine.
Sexual power	Cannabin, Strychnine.	Ditto, Cocaine and Opium alkaloids.

From Green's Encyclopoedia.

How to examine a man found unconscious. Look for—

I. **Signs of injuries**, specially on *head, chest and abdomen*. Are injuries the cause or consequence of unconsciousness?

II. **Characteristic smell in breath** :—Look for *marks of corrosion* on inside of mouth and lips, on cheeks, front aspect of body, fingers of hands &c. *Remember that a man's breath may smell of alcohol, from the accident of its having been given him by a kind passer-by.*

III. **Size of pupils** : (1) **DILATATION**=(a) *poisoning by aconite* (later stage), alcohol, atropine (belladonna), cannabis indica, chloral hydrate (later), chloroform, cocaine, conium (later), dhatura, gelsemium, hydrocyanic acid, narcotics, nitrous oxide, snake poisoning (daboia or rattle snake), stramonium, strychnine (during paroxysms); (b) *Diseases* :—apoplexy, asphyxia, acute yellow atrophy of liver, concussion of brain, diphtheria, epilepsy, meningitis, sunstroke, thrombosis of brain, trance. (2) **CONTRACTION** indicates (a) *poisoning by aconite* (early), calabar bean, carbolic acid, chloral hydrate (early), chloroform (first stage), opium, snake-poison (cobra), strychnine (in interval between spasms); (b) *ordinary sleep*; (c) *Diseases* :—hæmorrhage into pons, concussion of

brain (third stage), compression of brain (1st stage), meningitis, sunstroke (1st stage). (3) **INEQUALITY** indicates—*diseases* : Cerebral hæmorrhage, aortic aneurism, glaucoma, paralysis of third nerve, tubercular meningitis (2nd stage), tumour of neck or brain. Examine **retina** for optic or albuminuric retinitis, or specific choroiditis.

IV. Conjunctival Reflex absent in :—alcoholism, concussion of brain, compression of brain, asphyxia, meningitis, hydrocyanic acid poisoning. [Also test **tendon jerks**].

V. (1) Rigid arteries with increased tension : *poisoning* by convallaria, digitalis, strophanthus, oleander, lead (chronic) ; *Diseases* : uræmia, apoplexy, chronic lesions. (2) **Low tension pulse** : *poisoning* by amyl nitrite, chloral, cannabis indica, nitroglycerine, nitrous ether. (3) **Slow pulse**—*poisoning* by cannabis indica, opium, ergot (chronic), chloral, lead (chronic), aconite (later), convallaria, digitalis, strophanthus, tobacco ; *Diseases* : apoplexy ; diabetes, uræmia, medullary lesions (secondarily), meningitis. (4) **Quick pulse** :—*poisoning* by aconite (early), belladonna, dhatura, camphor, phosphorus ; acute yellow atrophy. *Diseases* :—collapse, epilepsy (later), medullary lesions, shock, concussion of brain, sunstroke. (5) **Endocardial presystolic murmurs**—indicating embolism.

VI. Respiration :—(1) **SLOW** in—apoplexy ; chloral *poisoning*. (2) **QUICK** in conium *poisoning* ; thermic fever, cerebro-spinal meningitis, acute rheumatism, uræmia. (3) **STERTOROUS** in—*poisoning* by chloroform or narcotics ; apoplexy, acute yellow atrophy of liver, concussion of brain, epilepsy (late), fractures of skull meningitis, uræmia. (4) **CHEYNE-STOKES TYPE**—in uræmia, apoplexy, meningitis.

VII. Blood anomalies :—(1) *Parasites*. (2) *Bacilli* (septicæmia &c.) (3) *Acetone* (diabetes). (4) *Leucocytosis* (inflammation). (5) *Loss of coagulability* (in some kinds of snake poisoning).

VIII. State of orifices of body, specially ears, nostrils, mouth for signs of hæmorrhage (fracture of base of skull, local injuries &c.)

IX. Temperature of body : (1) **RAISED** in—apoplexy (2nd stage), hysteria, malaria (pernicious), meningitis, phosphorus poisoning ; plague, rheumatic fever, sunstroke, septicæmia (2) **LOWERED** in *diseases* : = apoplexy (1st stage), acute atrophy of liver, catalepsy, cholera, collapse, diabetes, trance, tubercular meningitis (late) (b) *poisoning* by alcohol, chloral hydrate, carbolic acid, hydrocyanic acid.

X. Paralyses or stiffness of limbs, due to (a) *diseases* : hæmorrhage, abscess, tumour or inflammation of brain : or (b) to *poisoning* — conium, strychnine &c.

XI. Urinary abnormalities : *Albumen in excess*, renal or cardiac diseases. (2) *Sugar in excess* in diabetes, medullary lesions, amyl nitrite. (3) *Indican* in excess, turpentine, nux vomica, bitter almonds. (4) *Alkaloid* (atropine, morphine &c.) or (5) *Other poisons* (iodine &c.) (6) *Acetone* — Salicylates.

XII. Age and diseases and causative conditions incidental to it.

XIII. Examine contents of stomach for poisons.

XIV. Examine cerebro-spinal fluid by lumbar-puncture. [*Remember, that in any case, one or more causative conditions may coexist : e.g., an epileptic may fracture his skull, a diabetic may suffer from cerebral hæmorrhage etc.*].

Channels and means of administering poison :

1. *By mouth*—by itself or with food, drink, or medicine.
2. *By respiratory passages* by inhalation,—manifesting itself on lungs or wind pipe.
3. *By or under skin*—via wounds, blisters, growths.
4. *By other natural orifices of body, viz., rectum, vagina, ears, bladder.*

Circumstances which modify the action of Poisons :

1. **Quantity administered.**—In minute doses, *arsenic* is medicinal, in large doses an irritant, in enormous doses, cardiac inhibitor. In enormous doses, without inducing excitement,

alcohol kills at once ; *opium* in large doses is a narcotic and a stimulant in small doses.

2. **Their physical state** :—solid, powdered, liquid, gaseous—are the order in which the activity of poisons relatively increase.

3. **Channels of administration**,—in decreasing order of absorption are : *intravenously*, *endermically*, through *serous membranes*, through *mucous membrane* (broncho-trachea, stomach, rectum), by *unbroken skin*. [*Morphia* or *cocaine*, dusted on *wounded surface* ; ‘*perchloride*’ or ‘*carbolic*’ injected *per vaginum* ; gases through *lungs* :—all can cause fatal poisoning. Strychnine and many other poisons given *per rectum* are more poisonous than when given by mouth.]

4. **Vehicles with which given**.—*Alkaloids* given with charcoal or tannic or gallic acid, are absorbed with difficulty ; *corrosive* acids when diluted, act as irritants only. [Given with *alkalies*, *hydrocyanic acid* forms cyanides, which are not less active than the acid itself ; in mixtures, this acid floats on top and may be all taken in the very first dose, unless the mixture is shaken before being taken.]

5. **Chemical form** : *Baryta* is poisonous, but its sulphate is non-poisonous ; *perchloride of mercury* is more poisonous than its sub-chloride ; any *cyanide* is poisonous, but *pot. ferro-cyanide* is practically harmless.

6. **Age of the person**—Persons in the extremes of life are peculiarly susceptible to action of poisons. [*Children* tolerate *mercury* and *belladonna* well, but *opium* badly ; *old men* ill tolerate *quinine*, *mercury* and *arsenic*.]

7. **Idiosyncrasy** (= *hyper* - or *hypo* - sensitiveness, unaltered by habit)—Very small dose of a drug may kill a man (which others may tolerate with impunity) and thus raise

suspicious of homicide. *Quinine* may collapse, *mercury* salivate, *opium* may purge—even in B. P. doses !

8. **Habits.**—*Habitual* use of certain *organic* poisons establishes *relative* toleration, but ultimately produces cachexia. *Minerals* do not confer much immunity or tolerance. [In the Central Provinces, N. W. P. and Assam, many infants are habitually given opium, though opium is usually fatal to infants.]

9. **State of health.**—In *tetanus*, *dysentery*, *hysteria*, *hydrophobia*, *painful* conditions and *delirium tremens*, large doses of opium may be tolerated, while it is easily fatal in *apoplexy* or *renal diseases*.

10. **Rapidity of absorption.**—*Intoxication*, inflamed condition of gastric mucosa, *sleep* or *dyspepsia*, retard absorption.

11. **Accumulation.**—*Minerals* (mercury, lead, silver, arsenic) and only some *organic* poisons (*digitalis*, *strychnine*) tend to accumulate in the system, if given in small non-poisonous doses, and, as their elimination is less rapid than their absorption, act as poisons, after some time.

12. **Result of treatment adopted**—depends on whether treatment was initiated in proper time or with proper skill.

Fatal period,—for obvious reasons, is not fixed, varying with the nature, dose and state of poison and of the individual. Within 9 seconds, a poison may diffuse throughout the body.

General lines of Treatment in Acute poisoning :

1. **Eliminate the poison.**—(a) IN POISONED WOUNDS, excise them or suck the poison out of them, after rinsing your mouth with alcohol (brandy). (b) WHEN POISON IS INHALED,—give air, oxygen, chlorine or ammonia gas (diluted). (c) IN CASE OF SWALLOWING POISONS other than corrosives,—use

(i) **emetics*** or (ii) wash out stomach by means of **Stomach Pump** or oesophageal or Syphon tube, after evacuating its contents. [In children, use No. 12 male hard India-rubber catheter, fixing the free-end of it to an empty syringe-barrel or a small funnel]. (iii) Give a **purgative** in time. (iv) **Venesection** (up to 20 oz.) also removes alkaloids quickly. [Remember—not to give emetics or to pass stomach tube (a) in cases of *corrosive* poisoning (carbolic acid is an exception to this rule); (b) in *Strychnine* poisoning, too, do not attempt syphonage without previously chloroforming him; (c) in *Oxalic acid* poisoning too, if marks of corrosion are visible, tube should not be passed in].

The *Stomach Pump* is used in serious cases and the *Tube* in less urgent ones. Both must be slightly warmed, lubricated and guided along your finger, through the gagged mouth, into the oesophagus, past the epiglottis. Having put in the pump or tube, see *if air is coming out* of it (which will come out, if the tube is inside the wind, instead of the food, pipe), in which case, pull it out

* Select any of these and give it in copious tepid water:—

<i>Emetic</i>	<i>Dose</i>	<i>Nature</i>	<i>After-effects</i>
1. <i>Mustard.</i>	(<i>dr.</i> v—oz i)	Rapid, Direct	Stimulates heart.
2. <i>Ammon. Carb.</i>	(<i>Gr.</i> 15-30).	Direct	Stimulates heart.
3. <i>Vin, Ipec.</i>	(<i>dr.</i> ii-vi)	} Slow Direct & Indirect,	} Slightly depressant, suited to the weak & child.
(<i>1 dr. for child.</i>)			
<i>Pulv. Ipec.</i>	(<i>gr.</i> 20-30)		
4. <i>Copper sulph</i>	(5-10 <i>gr.</i>)	Direct, Rapid	Greatly depressant.
5. <i>Zinci sulph</i>	(30 <i>gr.</i>)	Direct Rapid	Less depression but some local irritation.
6. <i>Antim. Tart.</i>	(<i>gr.</i> 1-3)	} Direct & Indirect.	Previous and after-nausea and much depression.
<i>Vin. Antim.</i>	(1 oz.)		
7. <i>Apomorphine</i>	(<i>gr.</i> 10 (<i>Hyp.</i>))	} Indirect, Rapid	Safe if given hypodermically.
<i>Inj. Apomorph. hypod.</i>	(<i>m10</i>)		
8. <i>Sodii chloride</i>	(2 oz)	} Direct	Safe but not much reliable.
9. <i>Tepid water</i>	(Oj)		
10. <i>Alum</i>	(1 oz.)		

a bit and guide it in again. When it has been rightly passed in, let some warm water in, before you commence work and always pump out less than you let into the stomach.

2. **Neutralize it in situ** by *chemical or physical* antagonistics; *e.g.*, dialysed iron in cases of arsenic, acids for alkalies, tannin for alkaloids, bulky food in cases of swallowing glass or tin pieces, permanganate for vegetables, ligature above bites.

3. **Antagonize its action**—by its *physiological* antagonistic, as,—atropine to opium, physostigmine to atropine. Begin by giving the full therapeutic dose. [*The following hodge-podge is an all-round antidote (when freshly prepared):*—Saturated solution of FeSO_4 (100m) + calcined magnesia (88gr.) + carbo animalis (40 gr.) + water (800m). Iodide of starch is also so used.]

4. **Treat symptoms.**—(a) **To Ease pain**: hypodermic injection of morphine sulph. gr. $\frac{1}{2}$ — $\frac{1}{4}$ (b) **To stimulate Heart**: keep up the temperature of body,—by hot clothes, bottles, drinks or compresses. Give cardiac stimulants—by mouth, hypodermically or per rectum—Pituitary gland extract, Adrenal extract, Digitalin (gr. $\frac{1}{100}$), Caffeine (gr. 1 to 5), Coffee, Tea, Strychnine (gr. $\frac{1}{100}$), Camphor dissolved in ether (10%), 2 to 3 dr. per rectum, Oleate of Camphor (dose gr. $1\frac{1}{2}$), Tr. Musk (m 45 to 60), Ammonia inhalation (cautiously) (c) **To Stimulate Respiration**: Swab out throat; pull tongue forward; pull forward and raise lower jaw; keep throat raised and head and neck low; give artificial respiration (See p. 64), and Oxygen inhalation; dash cold water to face; flick the præcordium with cold towel; pour cold water on to neck; dip body alternately in hot and cold waters; faradise the phrenic nerve or the nasal mucous membrane (for 10 to 15 seconds); inject Atropine Sulph. gr. $\frac{1}{100}$ [Avoid ammonia inhalation, because it closes glottis by spasm] (d) **For Cerebral Paralysis**—(i) **due to anæmia**: rest in bed, head low, extremities

bandaged ; (ii) **due to hyperaemia** : strongly stimulate skin (by mustard plasters to nape of neck, soles and calves, or rubbing skin here and there with croton oil), ammonia inhalation, vinegar enema, venesection, marching the patient about. (e) **For Muscular convulsions** :—Avoid chloral and morphine ; give chloroform, ether or amyl nitrite (*m* 5) inhalation ; or by mouth, paraldehyde ($\frac{1}{2}$ dr.— $1\frac{1}{2}$ dr.), ammon. carb. (*gr.* v) or spt. ammon. aromat. (*m* xx), tr. belladonna (*m* 20) ; brandy, (1 dr) ; ether, (1 dr) ; mustard plaster or 'very' hot sponge to præcordia ; or, normal saline intracellularly or isotonic compound sodium chloride transfusion (intravenously.) (f) **For local demulcent action**—give milk, albumen of egg, cocoanut, olive or castor oil, ghee, butter, mucilage of gum or tragacanth, tokmari, isphagul, linseed, kateera, thick gruel of rice, flour or barley.

[CAUTION.—Do not burn an unconscious patient by overdoing hot bottles or break ribs by over-zealous artificial respiration].

5. **Keep patient alive** by giving him the help of proper posture and food,* by artificial respiration and by preventing dangerous complications.

[Refuse a death certificate].

Treatment of chronic poisoning : (1) *Avoid sources* of poisoning. (2) *Treat symptoms* as they crop up. (3) Attend to *hygiene* and *diet*. (4) *Stimulate*, if necessary.

Treatment of an Unknown Poison :—

1. Do *not* use stomach tube or pump ; and if you do use it at all, do it very cautiously. Instead, inject Apomorphine.
2. Give demulcents or the hodge-podge described above.
3. Treat symptomatically—stimulate if collapsed, give artificial respiration if cyanosed, etc.

4. Give castor oil (1 oz.)—if it is not a case of gastro-intestinal irritation.

Average time of onset of symptoms : One hour. But prussic acid takes 1 second, an ounce of oxalic acid takes 10 minutes ; opium on the other hand may take 6 to 12 hours.

Medico-legal points :—

1. The *amount of poison found in the viscera* is no test of the **dose taken**, because,—(a) some of it may have been *eliminated* with vomit, urine, sweat or foeces ; (c) some organic poisons *undergo decomposition* or chemical destruction inside body, during life time, by oxidation or putrefaction ; (d) *Volatile poisons* (like CHCl_3 or HCN) may, after killing an individual, leave no trace behind ; (e) only a *fraction of the body* (the viscera) is available for examination chemically ; and (f) in chronic poisoning, death may ensue, without a grain of poison being found in the corpse.

2. **Absorption is slow** (a) in the stomach, even though it be empty, in cases of—acute fever, gastric inflammation, cancer or ulcer, or when it is full of food or when poison is keratin-coated or is given as hard pill or during sleep ; (b) in disease or irritation of kidneys ; or (c) when one poison is administered with its antagonist.

3. Poisons may be *temporarily deposited* in the liver, kidneys, heart, lungs, muscles, brain, bones.

4. There are many poisons which *cannot be identified chemically*, partly, on account of carelessness and partly from want of our knowledge. Hence, so-called **absence of poison in viscera** does not negative death by poisoning.

5. **Poisons commonly selected in India :** For **HOMICIDE** : Acids (mineral), aconite, arsenic (most frequently), cerbera thevetia, gloriosa superba, mercury (perchloride), nerium

odorum, opium (for children), strychnine seed. FOR SUICIDE—opium (chiefly), *gloriosa superba*, *nerium odorum*, Arsenic, Mercury. FOR ROBBERY : *Cannabis indica* (majun), *dhatura* seeds. TO SIMULATE INJURIES : *anacardium semecarpus* ; *plumbago rosea*. ABORTIFACIENTS—See Chap. X. ACCIDENTALLY : Aconite, Arsenic, Mercury, *Nux Vomica*, Snake-poison. HABIT POISONS : *Cannabis indica* (hemp), cocaine, opium, spirits. FOR INFANTICIDE : *Calotropis procera*, opium, tobacco.

6. **True physiological antidotes** to poisons are rare. Morphine and atropine are *not* truly antidotal. Physostigmine and atropine *are* truly antidotal in many of their actions ; but *strychnine* antagonizes only the respiratory depression of chloral, morphine and aconite ; *digitalis* antagonizes only cardiac depression of aconite ; *nitrites* antagonize only vaso-constricting actions of *digitalis*, adrenalin and ergot.

7. Besides its immediately deleterious effects, a poison may, by its **remote effects** kill the individual or permanently incapacitate him (as phosphorus, ganja, corrosives).

8. **Mucous Membrane of stomach** may look red from (a) *colouring matter* of food (pân) or medicine (logwood) taken ; (b) congestion of natural *digestion* ; (c) rough use of hard *stomach tube* ; (d) *postmortem staining* ; (e) *irritant poisoning* ; (f) *acute gastritis* following ingestion of cold water when one is heated, or from other causes ; (g) *heart disease* ; (h) *cerebral congestion*. [Hypostasis occurs in dependent parts ; colour-stains are altered by treatment with acids or alkalies ; ante mortem active congestion is a diffuse blush, while passive congestion is associated with a similar condition in neighbouring viscera ; irritant poisons cause localized, patchy, active congestion (∴ opacity of tissues) and perhaps sub-mucous extravasation of blood with softness of mucosa and sticky secretion of mucus, to which poison-particles adhere.]

9. **Mucous Membrane of stomach is coloured** (1) *yellow* (in patches) in arsenical poisoning, (2) *blue or green*—in copper poisoning, (3) *brown*—in iodine or permanganate poisoning.

10. **Ulceration** of stomach resulting from disease is usually unobtrusive ; that from *corrosive poisoning* is painful, accompanied by redness of the mucous membrane in several places, and is covered with a dead slough, and the ulceration may extend to duodenum.

11. **Softening** if due to *inflammation* is patchy, but if due to *putrefaction*, affects the whole thickness of stomach-wall.

12. By mechanical means (tube) alone, poison that is liquid or suspended in liquid can be **introduced into the stomach post mortem** ; hence, if poison in *solid* form is found in stomach or poison is found *inside viscera*, it indicates *ante-mortem* ingestion.

13. **Presence of poison** in body need not necessarily be due to suicide or homicide ; it may be an accidental *constituent* of certain vegetables (e.g., oxalic acid) or *impurity* of a food (e.g., As. in beer) or may be *ingredient* of a medicine administered (Hg., As, etc.) or may have been *generated* inside the body from animal food eaten (ptomaine) or *mixed with* food or dejecta to support a false charge.

Duties of a medical man* in cases of

I. **Manifest Poisoning** : If, on your arrival, you find the—
Patient is alive.—Examine him clinically and note—

(a) *Time and mode of first appearance* of symptoms,
—whether they are intermittent or remittent or continuous ? Have you been summoned *late* ? If so, why ? (Suspicious !)

* In case of *females*, always consider if the poisoning be the result of administration of *abortifacients* ; or else, if post mortem evidence of attempts at foeticide is disclosed, suspicion may be thrown on the medical man's character.

- (b) *Relation* of food, drink or medicines to *onset* and *aggravation* of symptoms? Examine and secure all these. What is the exact time each was taken, last?
- (c) *Order* of appearance of symptoms.
- (d) Does anybody anxiously *volunteer* any *explanations* of symptoms? (This is suspicious).
- (e) Details of *Treatment*. Secure medicines prescribed.
- (f) History of *previous* or *contemporary* disease known.

[Send to Chemical Examiner (a) all (specially the first ones)—vomit, saliva, urine, foeces, (b) medicine-bottles and food matters, (c) clothes, earth or wood on which vomit may have fallen.]

Patient is dead.—Then simply send the evacuated contents of stomach and refuse a death certificate.

II. Suspected or Slow Poisoning :—With his medicine or food, a patient may be given, by some interested friend, at first a *poisonous* but *not fatal* dose, and this produces symptoms. As soon as these subside, a bigger dose is given; then still another and bigger dose, and so on, until patient dies of *exhaustion* or *inanition* and symptoms are attributed to dyspepsia or diseases. In such cases—

1. Have *urine*, *vomit* and *foeces* chemically examined. Keep with you portions of each sample you hand over to police or chemical examiner.
2. Ascertain—Are the *symptoms aggravated after food*? Is patient taking any *proprietary medicine* containing the poison? Secure it. Without rousing suspicion, note minutely all about *food*, *drink* and *medicines* and, if possible, secure samples for analysis and see the result of feeding an animal on the food or vomit.
[(a) Eliminate errors of diet; (b) see if cooking vessels are properly *kallaied* (tin-lined); (c) see what the lining

is made of. (*d*) Ascertain the condition of the particular food that caused poisoning, the source of the food-supplies and (*e*) whether any other people who purchased from the same sources were affected similarly].

3. Is *one* person always taking some part or other in *feeding or cooking*? For a day or two, relegate these offices to a trusted nurse, with strict order to do these herself, or transfer patient to a hospital or home and, watch if there is a change or amelioration of symptoms.
4. Watch for *acute exacerbations* of symptoms and have a *consultation*, when you can express your suspicions.
5. If your suspicions are *confirmed*, *now* (*but not till now*) inform (*a*) Guardian of the patient or patient himself, (*b*) the suspected person (*c*) and the Police.

Corrosive

versus

Irritant :

1. Causes *destruction* of parts with which it comes in contact, *beginning* with mouth.

2. *Onset*—immediate, with throat symptoms.

3. *Remote action* on the system, is *not* constant.

4. *Death primarily*, from—(*a*) Shock, (*b*) Suffocation, from oedema or spasm of larynx, (*c*) Syncope from extensive destruction of parts.

Secondarily from—starvation or exhaustion.

1. Sets up *inflammation* in parts in contact, *none* being found in mouth.

2. Immediate or late, but with gastro-intestinal symptoms.

3. Is commonly found.

4. *Primarily* from—(*a*) Shock. (*b*) Convulsions.

Secondarily from—Starvation.

[The line of demarcation between corrosives (caustics) and irritants is a very fine one and the one practically shades off into the other.]

Chemical analysis of contents of viscera.—The poisons found in the contents of viscera belong either to inorganic (metals) or organic (alkaloids) groups. To **minerals**, the *dry* and *wet* processes are applicable. These following are processes for *separating alkaloids and glucosides* :—

A. Stas's process. (1) Take the suspected matter, well pulverized, or the viscera (with their preserving alcohol) and slightly acidulate it with acetic or citric acid. (2) Digest this with alcohol. (3) Strain off this acid alcoholic tincture and let the solid matter settle. (4) Evaporate the tincture and when of syrupy consistence, add to it water acidified with acetic acid, and filter. (5) Take the filtrate and neutralize it with sodium carbonate. (6) Shake the neutralized mixture with ether, chloroform or amyl alcohol. (7) Separate the solvent from water. (8) Evaporate the solvent to dryness and get the dry alkaloid. (9) Dissolve the residue with very dilute hydrochloric acid and apply tests.

B. Dragendorff's process : In three stages :

I. Preparation of acid watery solution : (1) Digest the well-disintegrated substance with water slightly acidulated with sulphuric acid ; stand it for three or four hours ; then stir, filter and press the residue on fine muslin. (2) Repeat this process twice. Mix these filtrates (sulphates of alkaloids) and evaporate to syrupy consistence. (3) Macerate this syrup in alcohol for twenty-four hours. (4) Then stir and filter and wash the residue with alcohol. (5) Evaporate the alcohol from the alcoholic extracts, add water, and again filter.

II. Extracting in acid solution :—To filtrate, while still acid, add successively—petroleum ether, benzene and chloroform and evaporate down each.

III. Extracting in alkaline fluid :—(1) Saturate the acid watery solution with ammonia. (2) Extract the ammoniacal

fluid with, in succession, petroleum ether, benzene, chloroform, amyl alcohol. (3) Evaporate ammonia with powdered glass. (4) Extract the dry residue with chloroform.

The substances found in residues from these two fluids are :—

<i>Name of Solvent.</i>	<i>In residue from acid fluid.</i>	<i>In residue from alkaline fluid.</i>
Petroleum ether.	Carbolic acid, camphor, capsicin, piperine, picric acid.	Liquid volatile alkaloids, aniline, brucine, conine, emetine, nicotine, quinine, strychnine, veratrine.
Benzene.	Absinthin, colchicin, colocynthin, cantharidin, digitaline, elaterin, santonin, theine.	Aconitine, atropine, brucine, cinchonidine, codeine, emetine, hyoscyamine, narceine, narcotine, physostigmine, quinine, strychnine, veratrine.
Chloroform	Cinchonine, digitalin, helleborin, jervine, picrotoxin, saponin.	Cinchonine, morphine.
Amyl alcohol.	—	Morphine, saponin, solanine, salicin.
Chloroform.	—	Curarine.

Tests for Alkaloids.—Having isolated the alkaloid,—

1. *Test if it is really an alkaloid.*—An alkaloid (slightly acidulated by sulphuric acid) is precipitated by a solution of (a) iodine in potassii iodidi, (b) phospho-molybdic acid, (c) double iodide of mercury and potassium.

2. Find out the *group* it belongs to.
3. Apply *confirmatory* tests of its own.

For Inorganic Substances: Either separate the organic matter (with which the minerals are combined) by dialysis or destroy it as follows : (a) cut up the viscera into small pieces, mix with HCl and heat over a water-bath in a clean porcelain dish, adding occasionally, while stirring, KClO_3 ; then filter=clear solution of the metal as a *chloride* (**Wet Process**). (b) Or, char the organic matters over platinum and add to the ashes strong HNO_3 ; then add water and filter=*nitrate* of the metal (except Pb and Ba). (**Dry Process**). Evaporate it to dryness and add H_2S : (a) if ppt. is black or brown=Bi, Cu, Pb, Hg. (b) if orange,=Sb ; (c) if yellow=As, Cd, Sn.

General Remarks.—In this chapter, unless otherwise mentioned,—(a) we always refer to *Acute* cases of Poisoning. (b) '*Fatal Dose*'—represents usually the *minimum* dose known to have killed *adult* persons, as learnt from known cases. (c) '*Resemblance*' has reference to physical appearances.

CORROSIVE POISONS.—General Considerations.

Definition. A substance which in its *undiluted* state *destroys* the tissues of the body by *direct* chemical action.

Medico legal points.

1. **Homicidal** uses of Acids : (a) Vitriol (or Nitric acid) *throwing* on a person. (b) *Pouring* acid *into the ear* while one is asleep. (c) Making a *child* drink it. **Suicidal** use is rare in India, but common in England. **Accidental** Poisoning occurs from—(a) Injection into *rectum* as enema, by mistake ; (b) injection into *vagina*, to procure abortion ; (c) accidental *inhalation* of fumes of NO_2 , NO , HNO_3 , Cl , SO_2 .

2. A corrosive acid or alkali, if *diluted*, acts as an *irritant* ; still further diluted, as a *stimulant*.

3. Ingestion of Acids cannot alter the **alkaline reaction of blood**. About 0·2% free hydrochloric acid exists **normally in human stomach**.

4. **Remote effect** of drinking corrosives : (a) *When diluted* : cloudy swelling and fatty degeneration of muscles, liver, kidneys &c. (b) *When drunk concentrated* : stricture of oesophagus,—which, unless relieved, causes death from starvation, months or years later.

5. Ingestion of a **very large dose** may cause sudden death from *Shock* ; ingestion of a **few drops** also may cause sudden death from *spasm of glottis* (the poison finding entrance into larynx), without the poison entering into stomach. As a rule *consciousness* remains to the last in fatal cases.

6. If **salts** of hydrochloric, nitric or sulphuric acid are found on chemical examination of contents of viscera, it is necessary to know the quantity present, for, *traces* of them are found in *most food-stuffs*.

7. **Hydrochloric** and **Oxalic** acids remove ink impressions and fumes of HCl act injuriously on vegetables.

8. Though nitro-glycerine is the chemical combination of glycerine, HNO_3 and H_2SO_4 , it is not corrosive.

Symptoms :—*Onset*—immediate (during swallowing).

I. **Throat Symptoms** : (1) Marks of *corrosion* in mouth and-throat. (2) *Difficulty in swallowing*, each attempt at swallowing increasing the vomiting. (3) If epiglottis is swollen,—there is asphyxia.

I. **Gastro-intestinal 'irritation'**.

i. Violent *burning pain*—starting from mouth, going down oesophagus, to stomach,—thence radiating over abdomen, and doubling up the patient from very pain : least movement of abdominal muscles increases pain.

2. Immediate, *uncontrollable* retching and *vomiting*, in order, of—(a) Gas or froth, followed by stomach-contents, which may effervesce in contact with earth ; (b) Coagulated blood (which is altered greyish or brown); (c) Coagulated mucus, shreds of mucous membrane, even (d) Shreds of muscular coat of stomach walls.
 3. Severe *tenesmus*, but *no purging*; if any, stools are tarry in appearance. Abdomen is distended.
 4. *Lips*—are discoloured, swollen, blistered, or corroded.
 5. *Mucous membrane of mouth*—is corroded, softened with dots of hæmorrhage here and there. Viscid *saneous saliva dribbles* from mouth. Intense *thirst*.
- III. **Collapse symptoms** (from pain). 1. *Look*—anxious ; *features*, pinched, cyanosed or pallid. 2. *Respiration*—is feeble, noisy, painful. 3. *Pulse*—is feeble, quick, imperceptible. 4. Cyanosis, cold clammy, *sweats* come out ; *voice* sinks.
- IV. **Other symptoms**. 1. *Urine*—is passed with pain or is suppressed. 2. *Convulsions*—of face and lip-muscles occur from pain.

Termination.

- I. **Immediately** = Death within 24 to 36 hours, from—
 1. *Shock* (specially in cases of children).
 2. *Spasm or oedema of larynx*
 3. *Collapse*—due to pain or perforation of stomach.
- II. **Remotely**. Death (within weeks to years) from
 1. *Starvation* due to—(a) stricture of oesophagus or (b) destruction of glandular apparatus of stomach.
 2. *Septic absorption*.

P. M. Appearances : [Examine all *orifices carefully*].

1. *Lips and Chin*—discoloured,* corroded and swollen.
2. *Mouth*.—Mucous membrane is—in patches—corroded, softened, detached ; its colour is dull white (like moist parchment) or brownish (chamois-leather-like) ; bleeding is noticed here and there.

3. *Throat, larynx, oesophagus* :—their mucous linings are inflamed, corroded (ash-grey) or ecchymosed.

4. Marks of *streaks of saliva* on the chest or cheeks.

5. *Stomach* is collapsed and contracted ; perforated in places (in H_2SO_4 poisoning.) *Mucous membrane* is inflamed, stained black (H_2SO_4) or yellow (HNO_3) corroded, separated (specially along big curvature and near pylorus) and inflamed beneath these parts and between folds of rugae. *Contains*—tar coloured, fluid or clotted blood, mucus and shreds of mucous membrane. In **Ulceration** of stomach, (a) the patch is limited by inflammatory process, (b) its margins are thickened, (c) the aperture is regular and small, (d) there is no blackening or charring and (e) there are adhesions to surrounding tissues. In **perforations due to corrosive action**, (a) there are no inflammatory lines of demarcation, (b) the margins are disintegrated, (c) the aperture is large and irregular (d) it is blackened and charred (H_2SO_4) and (e) no adhesions are noticed.

* **Mucous membrane and skin are coloured**—(a) *Brown or black*—by Sulphuric acid. (b) *Grey*—by Hydrochloric acid. (c) *Yellow*—by Nitric acid. [Corrosives *soften* mucous membrane. Carbolic acid *hardens* it.]

Dark coloured cloth is stained by—(a) H_2SO_4 —Dirty brown, edge becoming red after a few days ; Colour may also be discharged, specially on adding NH_4OH . (b) HNO_3 —Yellow, orange-red or brown. (c) HCl —Bright red, changing to red brown in a few days.

If, on addition of weak KOH to a **yellow stain**, (a) the colour turns orange = *Nitric acid* ; (b) the colour is discharged = *Iodine* ; (c) the colour is unaltered = *Bile*.

6. *Intestines*—show in their upper parts the same signs as stomach,—the less marked, the farther from stomach.
7. Suppuration, sloughing and inflammation in *peritoneal cavity*, if death is not immediate.

SULPHURIC ACID— H_2SO_4 , Oil of Vitriol.

Similar action of:—Sulphate of Indigo, Sulphurous acid, Hydro-fluoric Acid (whose fatal dose is 4 dr).

Resembles:—Olive oil, Castor oil.

Fatal dose—1 dram. **Fatal period**:—18—24 hours.

Symptoms (special ones):—(a) *Constipation*. (b) *Tar coloured stools* (=altered blood or sulphides). (c) Darkening of blood in the vessels. (d) *Salivation*.

Treatment—[*Be quick!* **Never use tube or emetics**].

1. Give in water, well powdered, **weak alkalies**, e.g.—soap, magnesia, chalk, lime, soda carbonate, pot. carb; or, simply water in large quantities.

Demulcents, like—milk, albumen of egg, (See p. 175)

2. *To relieve the killing pain*—give **Morphia** (hypodermically, gr. $\frac{1}{4}$ or 8 m) or tr. opii. (1 dram, by mouth).

3. *For collapse*—Stimulate heart (See p. 174).

4. *If suffocation is urgent*—give weak ammonia-inhalation or do tracheotomy, or laryngotomy.

5. *To help healing*,—apply leech to pit of stomach.

6. *To keep alive*—give nutrient or stimulating enemata per rectum, and no food by mouth, for some days.

Medico-legal points :

1. **Even in a fatal case, no acid may be found in stomach or viscera, if there has been (a) free vomiting or**

(b) proper treatment or (c) patient has survived some days. On the other hand, the stomach-contents after taking any sulphate, followed by an acid (acetic, citric etc.) gives tests for H_2SO_4 .

2. Stomach contents need not necessarily be *acid in reaction* in all cases of poisoning by H_2SO_4 .

3. Vinegar, beer and most wines contain a soluble sulphate and have acid reaction.

4. Recovery after swallowing 1 oz. is recorded, by Mann.

Separation (a) By dialysis. (b) Treat the article, if viscid or solid, with a little aq. destil + acetic acid or, if necessary, digest with alcohol. Then filter. (c) *To separate from soluble sulphates*, add quinine to the concentrated fluid and then strong alcohol.

Tests : (a) + HNO_3 + Barium nitrate = white ppt. which is insol. in acids and alkalies, and which can be rendered sulphide by heating with charcoal. (b) + alcoholic solution of methyl violet = blue colour.

NITRIC ACID. HNO_3 .

Synonyms.—Aqua Fortis, Fuming spirits of nitre. [*Photographers' "Pyro"* (1 ½ oz.) = HNO_3 20m + Pyrogallic acid 1 oz.].

Fatal dose—2 drams. **Fatal Period** :—12 to 24 hours.

Symptoms.—(Special ones) :—

1. Skin and mucous membrane are burnt by it *yellow* (xantho-proteic acid.) (2) *Dyspnoea* from irritating fumes.

Treatment : See under H_2SO_4 P. 187.

Tests : (1) Acid in free state + Brucine = bright red colour. (2) Acid in combination + H_2SO_4 + Brucine = bright red colour. (3) + heat + H_2SO_4 + Cu = red fumes given off. **Separation**—by the Quinine process.

Medico-legal Points :

(1) HNO_3 + HCl = Aqua Regia, which dissolves gold.

(2) HNO_3 is used to sweat coins.

(3) HNO_3 + H_2SO_4 + Glycerin = explosive compound.

HYDROCHLORIC ACID. HCl.

Synonyms: Muriatic Acid. Spirit of salt.

Fatal dose—drams 4. **Fatal Period**—up to 3 days.

Symptoms:—*Special one*: Its fumes containing free chlorine irritate the larynx. **Treatment**.—See p. 187.

Tests: (1) + Ag NO₃=curdy ppt., sol. in NH₄OH, but insol. in HNO₃ (2) + H₂SO₄+MnO₂=Cl given off. [**Separation**—by quinine, as under H₂SO₄].

OXALIC ACID. C₂H₂O₄.

Similar action of (1) **Pyrogallie acid**, (2) **Oxalates**, e.g., *Salts of Sorrel*=pot. binoxalates, of *Lemons*=pot. quadroxalate.

Resembles—Magnes. Sulph., but has sour acrid taste.

F. Dose: dr. 1—4. **F. period:** ½ to several hours.

Symptoms: [In small doses it acts on *heart, brain* or *spinal cord*; in large, concentrated doses, as a *local corrosive*].

1. *Gastro-intestinal*: Burning pain from mouth to abdomen. The inside of mouth is bleached white. Rapid onset of bloody *vomit* and *stool*.

2. *Cardiac action* is feeble. *Respiration* is slow and jerky. Extreme general prostration: collapse.

3. *Lockjaw*. Tonic and clonic convulsions. Cramps in calf-muscles, tingling and numbness in legs, toes and fingers. Paræsthesia or anæsthesia of trunk or limbs.

4. *Narcotic action* in some cases—delirium, coma.

Sequelæ (if recovered): Temporary loss of voice and persistence of spinal-cord-symptoms.

Treatment. Do not use—(a) *carbonates of sodium, potassium, ammonium*; (b) *much water*, or (c) *Emetic*, or *pump*. [*Pump* can, however, be used in poisoning by oxalates, or by the Acid, if it has been taken diluted and it has not corroded mouth or throat].

1. Chalk or lime (saccharated solution or even lime-plaster, or magnesia, *with the least quantity of water*.

2. Stimulants, warmth. 2. Castor oil purge, later on.

Post Mortem Appearances: (a) If a *large* dose is taken, the mouth, throat, gullet and *stomach* mucosa are pale or reddened or even blackened (as in H_2SO_4), as well as softened and perforated. (b) Between the cortical and medullary rays of the *kidneys*, crystals of calcium oxalate are found. (c) *Intestines* are inflamed. (d) *Lungs*—are congested.

Tests. (1) $+AgNO_3$ =white ppt., sol. in HNO_3 and NH_4OH . (2) Neutralized mass $+CaCl_2$ =white ppt., sol. in HCl but insol. in acetic acid.

Separated from organic mixtures by boiling with water and precipitating filtrate with Pb-acetate. The ppt. $+H_2S$ =insoluble oxalates.

Medico-legal points.

1. Scillæ, Rhubarb, *chooká-pálam* (rumex vesicarius), cabbages, *ole*, *kachu*, *dmrool sák*—all contain oxalic acid or oxalates.

2 **Commercial uses of Oxalic acid:** (a) To remove rust and ink-stains, iron mould, colour from calico printing; (b) for clearing leather, straw, and wooden boards; (c) dyeing; (d) tanning; (e) for making ink; (f) as dehydrating agent in condensation; and (g) in chemical analysis.

ACETIC ACID $C_2H_4O_2$

Sirká, Sirko, Kádi-nillu

Similar Action of—Tartaric or Citric acid (more poisonous). [Vinegar=5% Acetic Acid. Tartaric and Citric acid occur in all patent "obesity reducing" medicines.]

Fatal dose—1 ounce. **Treatment.**—See p. 187.

Symptoms: 1. Mouth and tongue whitened. 2. Smell of it in the breath. 3. Suffocation. 4. Convulsions.

Separated from organic mixtures—by distillation.

Tests : *Acetic* : (1) $+ \text{H}_2\text{SO}_4$ = Colourless vapour with vinegary smell. (2) $+ \text{Fe}_2\text{Cl}_6$ = blood-red colour, which gives brown ppt. on heating. *Citric* : $+ \text{excess CaOH} + \text{boiling}$ = ppt. *Tartaric* : NH_4OH prevents ppt. by excess $\text{CaOH} + \text{boiling}$.

LIQUOR AMMONIÆ FORTIOR.

NH_4OH . Spirits of Hartshorn.

Similar action of (1) **Caustic hydroxides**, NaOH or KOH . (2) **Caustic Oxide**, CaO , Caustic lime, *Choonam*, *Choon* (3) **Caustic Carbonates**—Pearlash K_2CO_3 , *javakshar*; Soapleses, Na_2CO_3 ; Dhobie's earth, *Saji-mati*, *Saji-kskar*, *Saji-noon*, *Kshar*; Ammonium Carbonate $(\text{NH}_4)_2\text{CO}_3$.

F. Dose—1 to 4 dram. **F. Period**— $\frac{1}{2}$ hour to 2 days.

Symptoms (Special ones). *Onset*—immediate.

1. A sense of constriction in epigastrium. (1) *Mouth and throat* are strongly reddened; breath smells of it. (2) Increased *salivation*. (3) *Vomit* is alkaline. (4) There is *purging*. (5) *Air-passages* are markedly inflamed; hence, suffocation, loss of voice, stertorous respiration.

Treatment :—See p. 187. Special points :—

1. *Neutralize* by *ditute* acetic acid or vinegar, citric acid (gr. 30 to a pint of water) or lemon or orange juice. 2- *For spasm of larynx and dyspnoea*, give inhalation of— CHCl_3 , acetic acid or vinegar or steam; or do laryngotomy.

Medico-legal points :

1. In the *decreasing order of causticity*, the alkaline caustics are :— KOH , NaOH , NH_4OH , K_2CO_3 , Na_2CO_3 , CaO . [Recovery has followed ingestion of 12 oz of sod. carb.]

2. The *per centage strengths* of the B. P. caustic alkalies are : *Liqr. ammon. fort.* 32.3; *Liqr. ammoniæ* 10; *Lint.*

camph. co. 7·3 of NH_3 ; Liqr. potassæ 5·84; Liqr. sodæ 4·1. [Open Liqr. Ammon. Fort. bottles cautiously].

3. The B. P. doses are: Liqr. Potassæ, 10 to 30 *m*, Pot. bicarb., 5-20 gr.; Sod. carb., 5 to 30 gr., Liqr. Ammon. Fort., 3-6 *m*; Liqr. Ammon., 10-20 *m*; Ammon. carb., 3 to 10 gr.

4. **Malingers** throw lime into their eyes.

Separation—by dialysis (K, Na) or distillation (NH_3)

Tests: (1) Solution + tartaric acid in excess = white ppt. = *Potassium*; (2) Solution + $\text{PtCl}_4 + \text{HCl}$ = granular yellow ppt.; if this ppt. is insol. in alcohol it is potassium, if soluble, *Sodium*. (3) + Nessler's Solution = reddish brown ppt., sol. in excess of reagent = *Ammonia*. (4) + KOH = smell of Ammonia.

POTASSIUM PERMANGANATE K_2MnO_4 .

Fatal dose:—Unknown; in one case, 2 grains.

Symptoms—(1) Intense burning pain from throat to stomach. (2) Vomiting, which may be greenish. (3) Dyspnoea from swelling of epiglottis. (4) Collapse. (5) *Locally*, it eats into the tissues and stains them dark brown. Fingers, lips, tongue are coloured brown. (6) *Stools* when passed are greenish.

Treatment—(1) Use tube, only if it is soft. (2) Use demulcents.

Medical uses of Permanganate.—In amenorrhoea, cholera, snake-bite, gonorrhoea, leucorrhoea, for disinfection of drinking water, as an antidote to vegetable poisons.

IRRITANTS.

Definition :—An irritant is a poison that, by its specific action, sets up *inflammation* in *digestive* tract. Corrosives when diluted, act as irritants. [Irritant *alkaloids*—e.g., aconitine, apomorphine, colchicine, emetine, helleborin, laburnum, sava-dilla, stavesacre—are dealt with elsewhere].

Symptoms generally. [Onset :—After $\frac{1}{2}$ to 1 hour or more of eating. **Duration** : 1—4 days.]

A. Gastro-Intestinal "Inflammation".

1. *Mouth*.—When swallowed, probably, nothing ; soon after, acrid, burning, pricking or metallic taste is felt ; dryness and thirst, unrelieved by drink, which provokes vomiting.

2. *Throat*—is inflamed and dry : hence, sensation of constriction and heat, with constant desire to hawk, spit or swallow, difficulty in deglutition. [This precedes vomiting.]

3. *Stomach*.—Burning sensation developing into colicky pains, which radiate all over abdomen and are increased by pressure. *Vomiting*—(incessant and excited by drinks, in order, of—(a) contents of stomach, (b) slimy, bilious or bloody fluid and (c) rice-water-fluid (=shed epithelium and mucus).

4. *Purging* (profuse and persistent) in order, of—(a) Faecal matter, (b) Bloody mucous fluid, (c) "Rice water"-like fluid ;—with tenesmus, straining and burning sensations about rectum. Burning sensation and retraction of abdomen.

B. General :

Breathing—oppressed (from abdominal tenderness & pain).

Urine,—albuminous, scanty, or nil, or passed with strangury (i.e., associated with *metrorrhagia* in women, *priapism* in males).

Collapse—pinched, cyanosed *features*; restlessness, anxiety; cold, clammy skin; feeble, irregular respiration; small, frequent, irregular pulse; husky voice.

Clinical Diagnosis. Arsenic poisoning differs from—

1. *Cholera*.—which (a) occurs in epidemics; (b) without bloody vomit or stools; (c) without throat or epigastric pain.
2. *Acute Gastritis*—with colic, constipation, fever.
3. *Enteritis, Peritonitis, Intussusception*—in which, (a) stools contain undigested food; (b) febrile reaction may or may not be present; (c) bowels are confined.
4. *Acute gastritis following upon drinking cold draughts*, while one is heated.—(a) Onset of it is with fainting or shivering. (b) History will help and (c) there will be gastric congestion only and no inflammation.

Sequelae.

1. *Rapid death* (in 1 to 4 days) from—(a) Shock, (b) Involvement of Larynx, (c) Pain and collapse, (d) Perforations.
2. *Slow death* from—Exhaustion following inanition due to (a) Dyspepsia or (b) Stricture.

ARSENIC.

Forms*: (1) **Oxide** or acid (As_2O_3), White or common arsenic. *Sankha-bish, Sambala-kshara, Senko-bish, Sankhiya, Phatkyā somul, Safed-sanbul, Phenasma-bhasma.* (2) **Red sulphide**, Realgar, (As_2S_3), *Sandaracha, Manas-sila, Man-chhal* (3) **Yellow Sulphide**, Orpiment, Kings yellow (As_2S_3) *Zarda senko, Harital, Hartal.* (4) **Acid cupric arsenite**, CuHAsO_3 , Scheele's green, *Hirwa* (5) **Aceto-arsenite of copper**, $3\text{CuAs}_2\text{O}_4$

* According to Arsenic Act (14 Vict. Cap. 13, or Bombay Sales of Poison Act, (§ 17), white arsenic must be mixed with *soot* or *indigo*.

+ $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2$, Emerald green or Schweinfurth's green
Hirwa (6) **Cacodylic acid** and its salts.

F. Dose (Oxide) : 2—3 grs. **F. Period** :—24 hours or less.

Solubility in one ounce of—(a) *Cold water*—gr. $\frac{1}{2}$ to 1 (1 : 500 to 1000) ; (b) *Water boiling* for 1 hour,—gr. 12 (1 in 40) ; (c) *Hydrochloric acid*—freely. *Alkalies* and *alkaline carbonates*, when mixed with white arsenic, increase its solubility, while organic matters (tea, soup, &c.) decrease its solubility. [*Arsenite of copper*, though insoluble in water, is soluble in the *digestive fluids*. The poisonous quality of the (insoluble) *sulphides* depends on the amount of arsenious oxide present in them as impurity. *Alkaline arsenites*—are more soluble than the oxide].

Physical characters of the oxide : (1)—**Appearance** : *When fresh*, glassy-looking, with smooth vitreous fracture ; *when not fresh*, opaque and porcelain-like ; *when powdered*, it looks like flour. (2) *Adheres* to side of vessels, like flour. (3) *Odourless*. (4) *Floats* on water, if very finely powdered. (5) Very heavy and compact, sp. gr. = 3.7. A pinch of white arsenic weighs 17 gr. ; a heaped tea spoonful, about 150 gr. ; and a heaped table spoonful about 530 gr. (6) **Taste** : Practically none. **Feels** gritty (rough) in the mouth, however finely powdered.

B. P. Preparations (with doses) :—*Acidum Arseniosum*, ($\frac{1}{60}$ to $\frac{1}{15}$ gr.) *Liquor arsenicales* (1%), or liqr. potassæ arsenitis, Fowler's solution (2—8 m.) *Liqr. arsenici hydrochlor* 1%, (2—8 m.) *Arsenii iodidum*, ($\frac{1}{30}$ — $\frac{1}{5}$ gr.) *Liqr. arsenii et hydrargyri iodidi* or Donovan's solution, 1%, (5—20 m.) *Ferri arsenas*, ($\frac{1}{16}$ to $\frac{1}{4}$ gr.) *Sodii arsenas*, ($\frac{1}{40}$ — $\frac{1}{16}$ gr.) *Liqr. sodii arsenatis* 1%, (2 to 8m.)

Commercial uses of arsenic.

1. **To colour**—toys, papers, artificial flowers, tarlatan dress and idols for 'babys' ; candles, glass, paper-collars, hat-linings, fly papers, packing waxed-cloth, lozenges, wafers (and other edibles)

liquers, syrups, vinegar, sweetmeats, isinglass, chocolate ; arsenic is used in *dyeing, calico printing, in carpet making ; for painting (pantry shelves &c.,) by Scheele's green, Emerald green, Brunswick green, Paris green, Vienna green*—all which contain arsenic.

2. **As preservative.** To "cure" *skin* (in taxidermy) ; to *stuff* birds or animals ; to preserve *wood* or *manuscripts*.

3. **To destroy rats and vermins.**

4. **Medicinally (indigenous) :** As a *depilatory* and *parasiticide* ; for the cure of *fever, or syphilis* ; for stopping *teeth* ; as a *tonic* or *stimulant* ('bishboree') and *rejuvenator* of health ; as an *alterative to use of opium* ; as *aphrodisiac* ; as *abortifacient* ; as application to *cancerous growths* ; in several *cosmetics* ; as a *love philtre* ; as *cattle poison* ; to improve the coats of *horses*.

5. As *impurity* (sometimes) in—red *aniline dyes, beer, preparations of bismuth, antimony, sulphuric acid, opium*.

6. In *arts and industries*.—In *lithography, glazing* playing cards, preparing *shots*, working *gold*.

7. **Patent arsenical preparations :**—(1) *Sheep-dipping composition*, to kill fly in sheep. (2) *Weedkillers* (6 gr. per oz). (3) *Fly-water* (to kill fly) (1 in 22.). (4) *Fly powder* or paper or papier moure (1/4%). (5) Bath Buns. (6) *Baby's powder*. (7) *Rough on rats* (81–82%). (8) *Vermin-killer*.

Medico-legal points.

1. It is the **commonest homicidal poison** in India, because of its (a) want of *taste*, (b) *small* dose being fatal, (c) *symptoms* resembling those of cholera, (d) *colour* lending easy mixture with milk, sugar, flour, lime, cigarettes &c., (e) easy *availability*.

2. **Indestructibility.**—Minute traces of Arsenic may be found in a corpse years after interment. A *corpse* does *not* acquire arsenic by *impregnation*, from contact with *arsenical earth*. But *foods* may do so.

3. The **amount found** in the body is no test of the dose taken. If the patient *survives* a week after taking a toxic dose, it is difficult to detect arsenic in the body after death ; but if he *dies* before a week, the arsenic that remains, helps to preserve the body.

4. *By whatever channel taken*, during its elimination (within hours), **postmortem appearances are invariably found in stomach** even years after interment [**Exception** :—in *cerebral* types of poisoning and only in *rare instances*, even when taken by mouth, the p. m. gastro-intestinal signs may be *wholly* absent.]

5. Similarly, by *whatever* channel absorbed into the blood, arsenic is **eliminated chiefly** by the mucous membranes of *stomach* and *respiratory tract (bronchial tubes)*. It is also eliminated through the *urine, liver, skin* and *intestines*. Complete elimination can occur in 15 days or less. In chronic poisoning, its elimination is very slow ; hence it apparently tends to **accumulate** in spongy bones. It may be rapidly absorbed and copiously deposited in the tissues within three hours.

6. The **moulds** *penicillium glaucum*, *mucor mucedo* can absorb and give off arsenical fumes, when acting on arsenical wall-paper etc.

7. **Minute doses** of arsenical preparations are used *to cure* dyspepsia and chronic gastric catarrh of drunkards. *A very big* dose may be harmless by being instantly rejected by the stomach. Similarly, local application of a large quantity is safe, because it causes a slough to form at once and thereby prevents absorption of Arsenic.

8. *Acute* poisoning by Arsenic resembles a case of Cholera ; *chronic* poisoning, a case of Addison's disease or beri-beri.

9. **Prognosis** : **RECOVERY** from acute arsenical poisoning is *rarely complete*. Intermittent gastro-enteric irritability

ultimately leads to death. An irritable state of *skin*, stiffness of *joints*, paræsthesiæ, neuralgic *pains* and *paralyses* persist long. DEATH is due to collapse, coma, convulsions, or exhaustion—in very bad cases, and occurs between 1 and 3 or 4 days. It is quicker in cases with dominating nervous symptoms.

10. *Powdered* arsenic is not absorbed by UNBROKEN SKIN but solid *films* deposited on such skin, *solutions* and *ointments* are. Through ABRADED skin, solid arsenic is easily absorbed. Arsenic poisons, if INHALED in a *volatile* form; arsenuretted hydrogen is much more poisonous. Wall-papers, fabrics or wood-work coloured with Arsenic, may cause chronic poisoning from disintegration and *volatilization* of the arsenic. Local application of *a very large quantity* may sometimes be safe,—rapidly causing sloughing and thereby preventing absorption.

11. **Dangerous Preparations** (=organic): *atoxyl*, *soamin*, *arsacotin*, *cacodylates*, *kharsin*, *salvarsan* or 606, *orsudan*; their use is attended with blindness (optic atrophy), death etc.

12. Though, **onset of symptoms** is within 1/2 hour of taking arsenic, the presence of a large quantity of *food* or *mucus* in the stomach or *intoxication*, *sleep* &c. **delay** the onset of symptoms. In rare cases, onset may be immediate or delayed even by 10 hours.

13. Though volatilized by heating, arsenic may be found in ashes of wood or in charred remains of deceased persons, about the **funeral pyre**, as, during cremation, the combustion of Arsenic is not complete.

(A) **ACUTE POISONING.** [See **Diagnosis**, p. 194.]

(A) **Usual symptoms.** **Onset** (usually)—1/2 to 1 hour.

I. **Gastro-intestinal "inflammation"** (see p. 193) with these special points :—

(1) *Tongue* :—at first thickly furred (white), becomes red at tip and margins, being sometimes unnaturally red all over.

(2) *Vomiting* (incessant and excited by drinks)—in order, of—(a) Contents of stomach, (b) Slimy, bilious or bloody fluid (*coloured*, from presence of bile, black from admixture of soot, blue from indigo); (c) Rice-water-like fluid.

(3) *Stomach*—may get perforated.

(4) *Salivation*—in some cases.

[Rarely, vomiting and gastric and abdominal pain may be absent, as arsenic destroys sensibility.]

II. Nervous Symptoms : (1) Frontal headache, with injected conjunctivæ. (2) *Tingling* or burning sensation all over. (3) *Cramps* in calves of legs. (4) *Convulsions*. (5) Coma.

(B) Unusual Symptoms.

1. *Anticipation* or *postponement* (18 to 20 hours) or *remission* or *intermission* or even *absence* (as in Orfila's case) of symptoms.

2. *Purely narcotic* symptoms : onset with headache, dizziness, dim sight, perhaps, contracted pupils,—ending in rapid and fatal coma (as in opium poisoning); or, *Acute maniacal* symptoms.

3. *Neurotic Symptoms* : General *anæsthesia* or *multiple neuritis* or *paralysis* of limbs. *Lock jaw*, *convulsions* (tetanic, choreic or epileptiform).

4. *Fatal initial collapse*, with little gastro-intestinal trouble.

5. *Fever* and extreme *abdominal pain*.

P. M. Appearances : (A).—IF DEATH OCCURS SOON :—

Externally, those of loss of much fluid : *Body*—is pinched and shrivelled. *Eyes*—are sunk in sockets. *Fingers and toes*—are cyanosed and shrivelled.

Internally : [*Rarely, gastro-intestinal signs may be absent.*]

1. *Tracheal* and *bronchial* mucous membrane is much reddened. *Lungs*—look dry; or are congested.

2. *Blood*—is thick and tarry. *Right heart*—contains grumous, clotted blood; *left*—is usually empty and shows subendocardial petechiæ and congestion on the posterior wall and the bases of muscoli papillares.

3. *Brain, Lungs, Kidneys, Liver*—are all congested.

4. *Oesophagus* in its lower part—is congested.

5. *Stomach* :—(i) Peritoneal coat—congested.

(ii) Contents : (a) Bile-tinged or bloody (dark coloured) or rice-water fluid. (b) Masses of mucus, with particles of arsenic, adhering (inspite of efficient stomach washing).

(iii) Mucous membrane :—(a) Intensely inflamed, looking velvety all over or in patches (around embedded particles of Arsenic)*; (b) with or without—petechial hæmorrhages, or (c) extravasations or (d) superficial erosion,—which are better marked along posterior wall, pyloric end and rugae.

6. *Small intestines*—inflamed, the less the farther from stomach; contain bloody or bilious fluid and flaky mucus.

7. *Large intestine*—mostly empty and contracted. [*Rectum* and *Cæcum* are inflamed, if poisoning has been by repeated small doses.]

B.—IF PATIENT SURVIVES FOR A FEW DAYS, he is found with

8. *Liver*—in fatty degeneration.

9. *Kidneys*—showing parenchymatous nephritis.

10. *Muscles*—looking greasy.

11. *Alimentary tract*—in an inflamed and ulcerated state.

Treatment. [Be Prompt! Avoid *Zinc Sulphate* or *Copper Sulphate* or any other metallic irritant evacuant.

* Some of these embedded particles of white oxide turn into and cause stains of yellow sulphide. Sulphide cannot so change into oxide.

1. *Evacuate*, (if none) by stomach tube carefully or **apomorphine** or copious greasy, warm water or by tickling fauces. [*Emetics may fail to act, if stomach is benumbed.*]

2. *Demulcents* : white of egg, etc., See p. 175.

3. **Neutralize** by—tablespoonful doses of fresh **ferric hydroxide**, given in hot water. [**Ferric hydrate** ($\text{Fe}_2\text{O}_3\cdot\text{H}_2\text{O}$) = Tr. Ferri Perchlor + NH_4OH or Soda or mag. carb. It is a reddish brown gelatinous mass which rapidly deteriorates. *About 8 to 12 gr. of it neutralize 1 gr. of Arsenic or 32 parts by weight neutralise 1 part by weight of Arsenic.* It acts when given *in excess.*] In the absence of ferric hydrate, give *dialysed iron* in ounce doses or *hydrated oxide of magnesia* or *calcined magnesia*.

4. *Stimulate*, by brandy or ether hypodermically (**not by mouth or rectum**), hot blankets, hot bottles to extremities and to abdomen. *To check gastro-intestinal inflammation*, leech the pit of stomach. *To check painful but ineffectual diarrhæa*, give milk and castor oil. *For tetanic convulsions*, give chloroform. *To relieve thirst*, give ice to suck. *To relieve pain*, warmly poultice abdomen, or inject morphia hypodermically.

5. *To counteract suppression of urine*, cup over kidneys.

6. *To nourish*, give diluents—skimmed milk,—followed occasionally by slightly alkaline mineral waters, lime water with oil ; or resort to rectal feeding.

B. SUB-ACUTE POISONING.*

I. **Gastro-enteric "irritation"** : (1) *Throat* is dry, reddened, irritated. (2) *Mouth*—dry. *Tongue*—at first furred ; then red

* From habitually taking articles contaminated with arsenic—like beer, glycerin, malt, vinegar, glucose, caramel, Demerara sugar, baking powder, treacle, jams, malted food etc.

and irritable. (3) Nausea and vomiting. (4) Abdominal pain, mild diarrhoea. (5) Jaundice. Hence—*Inanition* and *wasting*.

II. **Nervous Symptoms** : 1. *Peripheral neuritis*. (a) Paræsthesiæ—formications etc. (b) Pain in muscles and fingers. (c) Stiffness and numbness of fingers. 2. Herpes, pigmentation. 3. Restlessness, anxiety, fear of impending death.

III. **Eyes** : *Coryza* of eyes and nose. Itchiness and sensation of sands in the eyes. *Conjunctivæ* are red, granular and itchy. *Eyelids* are puffy. *Optic atrophy* (blindness).

IV. **Albuminuria**—with hyaline and epithelial casts.

Separation & Tests : (1) To a portion of the yellow ppt. obtained by adding H_2S , (in the wet process) add HNO_3 and fuse with Sod. carb. and nitrate=sodium arsenate. To this sod. ars. + ammonio-nitrate of silver=pale yellow ppt. changing, under exposure to day-light, to greenish brown ; or, to this sod. ars. + ammonio-sulphate of copper=light green ppt., soluble in all acids and in ammonia, but not in potash or soda. (2) *Marsh's Test* [This is not conclusive, in presence of organic matters and should be used to confirm Reinsch's test. It does not apply, if sulphides or arsenates or arsenic acid is present.] : suspected substance (liquid or made liquid by previously boiling in water)+ HCl or K_2CO_3 —introduced into a vessel from which H is being evolved= AsH_3 . Ignite it and get a black or brown stain on cold white porcelaine. This stain (a) is soluble in a solution of chlorinated soda ; (b) it disappears on treatment with HNO_3 but reappears as a lemon-yellow ppt. on treatment with H_2S ; (c) it forms a yellow ppt. at line of junction of $AgNO_3$ and NH_4OH -mixture ; (d) it is deposited as a brown mirror beyond that part of the tube to which dull heat is applied. (3) *Reinsch's Test* : Suspected article + H_2O + HCl + Cu + boil=iron-grey coating on copper. Heat this in a reduction-tube=minute octahedral crystals. [Bismuth, antimony (with non-cystalline deposit) and mercury (with globular deposit) answer this test. In the presence of strong acids, this test is not got.]

ANTIMONY, Sb.

Forms : (1) **Tartar Emetic**, $\text{KSbC}_4\text{H}_4\text{O}$, Bronzing liquid.
 (2) **Chloride**, Butter of antimony, SbCl_5 . (3) **Black trisulphide**, Sb_2S_3 , *Surma, Kohal*. (a) **Trioxide** Sb_2O_3 . [Note :
 (a) The orange coloured, precipitated sulphide is *not* poisonous.
 (b) Antim. Tart. has been sold in mistake for tartaric acid.
 (c) *Cream of Tartar* = Potassii tartras acidus, $\text{HKC}_4\text{H}_4\text{O}_6$.]

Resembles : Mag. sulph., Soda carbonate.

Fatal Dose (Tartrate) = 10 to 20 gr. ; smallest dose known for adult, gr. 2 and child, $\frac{1}{4}$ gr. **Fatal Period** : 6 to 10 hours.

A. ACUTE POISONING.

(a) **Usual Symptoms.** (See. p. 193). The special ones are :—

1. *Metallic taste* is felt. 2. *Voice* is occasionally lost.
3. *Heart, Muscular and Nervous Systems* become early and seriously depressed. \therefore *Collapse*, muscular prostration, copious *sweating*.
4. *Respiration* is irregular, slow and angina-like pains come on quickly.
5. *Urine* first increased, then becomes bloody and is voided with pain. *Cramps* in arms and legs.

(b) **Anomalous Symptoms** : (esp., if dose is *very* large.)

1. *Vomiting*—absent ; intense *prostration* present.
2. *Narcotic* symptoms : *delirium, insensibility*.
3. *Neurotic* symptoms—convulsions, tetanic spasms.
4. *Pustular eruption* appears on throat, face and body and even on mucous membrane of stomach.

P. M. Appearances : [*Gastro-enteric lesions may be absent*].

1. *Mouth, throat and oesophagus* : Congested and ulcerated. *Tongue*—furred and soddened.
2. *Viscera generally*—are intensely congested.

3. *Stomach*—either pale yellow or shows intense or patchy inflammation, ecchymosis, superficial erosions.
4. *Intestines*—inflamed. *Cæcum*—minute ulcerations.
5. *Heart*—nothing characteristic. Venous system engorged. *Brain & Lungs*—occasionally inflamed.

Treatment: Use pump (except in poisoning by chloride). Give—**Tannic Acid** (2 dr. to pint) as often as patient vomits. Thereafter check unnecessary vomiting by—ice, opium or morphine ; give external warmth and stimulants.

B. P. Preparations : *Antim. oxidum* (1–2 gr), *pulv. antimoniales* (3 to 6 gr), *antim. sulphuratum* (1 to 2 gr), *antim. tartaratum* ($\frac{1}{24}$ to $\frac{1}{8}$ gr., $\frac{1}{8}$ to $\frac{1}{4}$ gr. and 1 to 2 gr.,) *pil. antim. co.*, (Plummer's) (gr., 2–20) *vinum antim.* (10 to 30 m. or 2 to 4 dr.). For children's doses, see B. P.

Medico legal points.

1. **Fatality and dose**—Nauseant, medicinal, single dose as well as repeated doses of antimony may be fatal to the *infirm, aged or exhausted*. But *Children* tolerate large doses of tartar emetic, specially while suffering from diseases of larynx and lungs. Ingestion of a *very large dose* however is *not* fatal, owing to its prompt ejection.

2. **Chronic poisoning** is rare in this country and *acute poisoning* is usually **accidental**, antim. tart. being taken in mistake for mag. sulph or soda carb. **Homicide** is rare.

3. **Indestructibility.**—*Minute amounts* of the drug can be detected in the body long after death—as it has a preservative effect on tissues. But no charge of homicide lies, until a substantial amount is found in body and its presence cannot be otherwise accounted for.

4. **Patent preparations.**—*Children's "teething powders"* contain antimony: Dixon's pills, Dr. Johnson's pills, Aciocell's pills contain gr. $\frac{1}{8}$ to $\frac{1}{5}$ in each.

5 A preparation of antimony, like one of bismuth, copper, iron or zinc, is often **contaminated** with arsenic. But antimony is neither a constituent of *the body* nor an impurity of *foods and drugs*, unless accidentally or wilfully mixed.

6. *Butter of antimony* is used as a caustic in surgery and as a source of oxide of antimony in pharmacy. Though insoluble in water, it is soluble in the fluids of stomach. Ointments containing antimony have caused local *necrosis of bones*, specially of the cranium.

7. **Selective action** : By whichever channel absorbed, it acts on *lungs* and *alimentary* system, can raise pustule on *skin*.

8. **Diagnosis** : from **Aconite** : Antimony is an irritant to *skin* and *mucous membranes*, is an *expectorant* and *cholagogue* and causes *fatty degeneration* of, and is deposited in, the tissues. From **Arsenic** : Antimony causes greater and earlier *depression*, profuse *perspiration*, greater irregularity of *pulse* and the more irregular *respiration*.

9. **Eliminated** chiefly in urine.

B. CHRONIC POISONING.

Symptoms.

I. **Gastro enteric "catarrh"**.—Intractable or intermittent
(a) loss of appetite, *nausea* and *vomiting* (mucous and bilious.)
(b) *Watery motions*, followed by constipation. ∴ Emaciation.

II. **Asthenia**.—Disproportionate *muscular prostration*—cardiac and general : ∴ muscular weakness ; *pulse*—small, feeble and frequent.

III. **Cutaneous troubles** : *Pustular eruption* on skin or palate or a *red efflorescence* on the skin. Skin cold, clammy ; *sweating*, without febrile excitement. [*Lungs* are often congested].

Post mortem Appearances :

1. *Fatty degeneration* of—liver, kidneys, heart.
2. Lessening of *glycogenic functions* of liver.
3. *Orifices* of body (mouth, rectum) excoriated.
4. *Skin* and *conjunctival* troubles.

Treatment (subacute and chronic cases) :—

1. *Remove source* of poisoning.
2. Treat symptoms. Use *opiates*.
3. *Food* : liquid, nourishing, digestible, predigested.

Tests : (1) *Marsh's test* ;—The deposit obtained on copper, sublimes at a higher temperature. (2) Soluble salts of antimony give orange-coloured ppt. with H_2S in acid solutions, which is soluble in yellow $(NH_4)_2S$ and in strong HCl . *Reinsch's test* : a 'bluish' stain is obtained closer to the heated portion and the sublimate (obtained with difficulty from it) is amorphous, not crystalline.

BISMUTH,* Bi.

Form—Subnitrate, Pearl white or Magistery of Bismuth.

Fatal Dose :—2 to 6 drams.

Symptoms—(1) **Acute cases**—those of an irritant poison with anuria, salivation, delirium (2) **Subacute Cases** (from taking repeated large doses) :—gradual failure of strength and a *gangrenous form of stomatitis*. [Absorbed from burnt surfaces, it may form a white false membrane on faucis which may soon get gangrenous.]

Treatment : See under Antimony, page 204.

MERCURY.

Forms and Fatal Dose : (1) **Quick-silver**, *Ras*, *Parad*, *Para*. (2) **Perchloride** or proto-chloride Hg_2Cl_2 , *Calomel*, *Rasakarpur*. (3) **White precipitate** or ammonio-chloride

NH_2HgCl (F. dose = $\frac{1}{2}$ to 1 dr.). (4) **Red precipitate**, HgO (F. dose = 1 oz). (5) **Mercuric Nitrate** $\text{Hg}(\text{NO}_3)_2$ —(F. dose = 1 dr.). (6) (a) **Cinnabar** HgS , *Hingul*, *Chinese sindur*, *Shingarf*. (b) **Vermilion** HgS *Rasa-sindoor*, *Makaradhwaj*. (c) **Black Sulphide**, HgS , *Kajjali*. (7) **Cyanide** or prussiate of mercury, $\text{Hg}(\text{CN})_2$. (F. dose = 20 gr.) It is non-corrosive. (8) **Thiocyanate** or **Sulpho-cyanide**, $\text{Hg}(\text{SCN})_2$, found chiefly in Pharaoh's serpent (4 gr. in each). (9) Turpeth mineral, mercuric sulphate, $\text{HgSO}_4 \cdot 2\text{HgO}$. (F. dose = 40–60 gr.)

Fatal period : 24 hours to 5 days.

B. P. Preparations :—*Hyd. c. creta*, 1–5 gr ; *pil. hydrarg.* (1 in 3), 4–8 gr ; *liq. arsenii et hyd. iod.* 5–20 m ; *hyd. perchlor.* $\frac{1}{12}$ to $\frac{1}{16}$ gr ; *liqr. hyd. perchlor.* (1 in 240) $\frac{1}{2}$ –1 dr. ; *hyd. subchlor.* $\frac{1}{2}$ to 5 gr ; *pil. hyd. subchlor. co.* (Plummer's pill—1 in $4\frac{1}{2}$), 5–10 gr.

Patent Preparations : Mordant Norton's drops, Solomon's anti-impetigines, Poorman's friend, Cluny's worm lozenges, Brown's lozenges, Wright's pearl ointment, Storey's worm cakes, Mitchell's pills, Kyser's pill.

Commercial uses : In preparation of mirror, thermometer, barometer ; in working furs, bronze, felt ; in preparing dyes and colours ; in kaviraji medicines ; as amalgams and alloys ; pharaoh's serpent ; cosmetics, vulcanized rubber-plates, confectionary, wafers.

Medico-legal points :

1. **Relative Toxicity of preparations**.: (1) Chemically pure, **metallic mercury** taken in bulk should not poison a man unless a part of it were to be converted into a soluble poisonous salt inside the body. But **finely divided**, pure, metallic mercury (e. g., in blue pill, blue ointment, grey powder) in large doses is fatal. [In finely divided state, mercury is easily volatilized at a low temperature, and converted into the poisonous carbonate. (2) **Salt of mercury** and *impure**

* Arsenic is often an impurity of preparations of antimony, bismuth, mercury and HCl , H_2SO_4 .

metallic mercury are both poisonous. [Salts of mercury are very readily absorbed by *unbroken skin*, if in very fine division or solution. Hence beware of prescribing skin applications in large quantities].

2. **Mercurous** salts are less poisonous than **mercuric** salts; the former are prone to be easily converted into the latter. [By keeping carelessly or for long time, *calomel* is converted into corrosive sublimate and *grey powder* into red and black oxides. *Calomel*, given with chloride of ammonium, sodium or potassium for a time, becomes converted into corrosive sublimate inside the system and poisons the eater.

3. **Channels of Poisoning.**—(a) By *mouth*; (b) from injections, washes, pigments applied to *genitals* or *rectum*; (c) by *skin*, from local applications; (d) by *nose*, as vapour or dust and (e) by *mucous surfaces*, as from artificial dental-palate.

4. **Elimination.**—*Perchloride* in acute cases is found in urine in 2 hours and in chronic cases, in saliva in 4 hours after taking it. A person may die after, say, 2 weeks, from perchloride poisoning, without a trace of mercury being obtained from the body. Its strong metallic, astringent taste prevents its secret administration homicidally.

5. **As. versus Hg.**—Finely powdered Arsenic floats on top of liquids, *perchloride* falls to the bottom; in arsenic poisoning, symptoms come on after some time, mercurial symptoms come on immediately; the vomit in arsenic is rice-water-like, that in perchloride poisoning is a stringy mass of mucus.

6. The B. P. dose of *calomel*, $\frac{1}{2}$ to 5 gr., is, in practice, very often exceeded with benefit, and it is in small doses (alone or combined with opiates or astringents) that mercury is more likely to salivate even fatally, than in big doses. Small doses of mercury quicken the metabolism of the body, but large doses have the opposite effect.

7. *Perchloride* is used for preserving feathers and skins and is a medicine for all stages of syphilis. The addition of sodium or ammonium chloride or of acid hydrochloric dil. to water, increases solubility in it of perchloride.

8. **IN SUBACUTE POISONING***—when the dose has not been fatal immediately—there will be the same symptoms as in acute poisoning, but only they will be followed by rapid exhaustion, excessive salivation and death.

9. Mercury is used **homicidally**.

10. "**Salivation** may (a) *last* for almost any period, even 6 years; (b) *intermit* and *recur* after intervals of months; (c) *children* are rarely salivated. [*Cancrum oris* is quite another disease, though apparently resembling worst cases of salivation].

11. Besides those with **idiosyncrasy** against mercury, it is *ill borne* also by those who are old or generally run down in health, or those suffering from Bright's disease, anæmia, chronic diseases. *Children* tolerate mercury well.

12. In some cases of acute poisoning, *pain* in the abdomen *may be wholly absent*.

(A) ACUTE POISONING [Onset—immediate]

Symptoms: See p. 193; points special to it are:—

1. *Countenance*, swollen and flushed; or, pale and anxious.
2. *Metallic taste* and *burning sensation* are felt,—the latter from mouth to stomach.

Salivation—occurs after 24 or more hours.

Mucous membrane of mouth (tongue, pharynx etc)—get swollen and covered with white, shrivelled sloughs.

* *Acute* poisoning by mercury resembles a case of cholera; *subacute*, of dysentery; *chronic*, of dyspepsia.

Larynx, Glottis, Epiglottis—become oedematous ; therefore, *Voice*—is hoarse and husky, *Breathing*—difficult and noisy, specially in children, who may die of asphyxia in consequence.

3. *Vomit*—is stringy mucus. Abdomen (specially epigastric region)—is hypersensitive and distended.

4. *Urine*—more or less suppressed, contains epithelial or granular casts and albumin. *Cramps* (muscular)—occasionally.

5. *Collapse* :—*Pulse* small, rapid, irregular, almost imperceptible. *Skin*—clammy, erythematous.

6. *Convulsions*, drowsiness, coma.

Treatment :

1. *Emetics*—(**mustard**) or stomach tube (if required), *after giving* mag. carb., or lime water or milk or other mucilaginous drinks or **albumen of eggs**. [*Albumen of one egg neutralizes 4 grains of perchloride.*] *Encourage vomiting, because, albuminate of mercury is soluble in an excess of albumen.*

2. *For pain and purging*—tinct. opii 20 min. by mouth.

3. *If urine is suppressed*,—dry cup over^t kidneys.

4. *Warmth, demulcents and stimulants* should be continued for some days.

P. M. Appearances :

1. *Lips to oesophagus, epiglottis and throat*—swollen (inflamed) and of an ash-grey colour and ecchymosed in patches.

2. *Stomach*—shows greyish (metallic) or black (HgS) deposit over mucous membrane, which is congested, hardened, ecchymosed and corroded in patches. (Perforation is rare.)

3. *Large intestines* (specially, *caecum* and *rectum*)—are congested and ulcerated.

4. *Kidneys*—are acutely inflamed (interstitial) and contain deposit of calcium salts in tubules.

(B) CHRONIC POISONING.**Symptoms :**

I. **Oral** :—*Breath*,—is foetid. *Tongue* and *Gums*—swollen and ulcerated, the latter showing blue lines. *Salivary glands*—swollen and inflamed : \therefore , *salivation*. *Swallowing* and *breathing* are difficult. *Jaw*—with periostitis.

II. **Gastro-intestinal** :—Loss of appetite. Nausea. Occasional *vomiting*, *diarrhæa* and *colic*.

III. **Cutaneous**. *Eruptions*—eczematous, erythematous or pustular. *Pallor* or *pigmentation*. *Hairs*—fall out. *Nails*—become brittle.

IV. **Nervous** (“mercurial erethism”) *Temper*—becomes irritable. *Headaches*—occur chronically. *Insomnia*. *Memory*—fails. *Hebetude*, *Hallucinations*, *delirium* or attacks of *acute mania*—occur.

Tremors (and weakness)—in succession, of face, lips (\therefore embarrassed speech), tongue, arms, hands, fingers, legs and even of trunk. [These tremors (*a*) start as mere unsteadiness and run on to such violence as to resemble convulsions ; (*b*) are absent during sleep only ; (*c*) are increased by emotion ; (*d*) are seldom ever cured, and (*e*) get worse with the progress of the disease]. *Hyperæsthesia* or *paræsthesia*—also found.

V. **Bleeding tendency** : *hæmoptysis* (\therefore hacking cough.) *Anæmia* \therefore *Fever*, emaciation, *cachexia* and exhaustion. *Urine*—glycosuria and albuminuria.

Treatment :

1. *Remove source of poisoning.*
2. *Secure elimination by*—(*a*) *sulphur baths* or occasional warm baths ; (*b*) *calcium phosphate* and *pot. iodide*, internally in fractional doses (cautiously) followed by mag. sulph.

3. *Nourish*—by digestible food. Give best hygiene. Galvanise and massage—muscles.

4. *Stimulate*—specially by atropine.

5. *Cleanliness of the mouth* should be insisted upon—alum, tannin, cinchona, thymol, pot. chlor. etc. being used.

Analysis and Tests :—(1) *If dry solid*, mix with sod. carb. and charcoal and apply *Marsh's* test (globules sublimed).

(1) *If in organic solution* : *Reinsch's* test—after boiling it in hydrochloric acid solution = white, grey or silvery deposit, (which examine microscopically). (2) All salts of mercury are volatile. (3) + H_2S = black ppt., which is insol. in HNO_3 but sol. in aqua regia. (4) + KI = green ppt. (-ous) or red ppt. (-ic).

LEAD Pb. *Sheesha, Sheeshak.*

Forms: (1) **Acetate** (neutral) or Sugar of lead, $Pb(C_2H_3O_2)_2$ [*It looks like loaf-sugar.*] (2) **Carbonate** or White Lead, $2PbCO_3 + Pb(OH)_2$, *Safedá*. (3) **Red oxide** or Minium, Pb_3O_4 , *Metiya sindur*. (4) **Monoxide**, Litharge, massicot, PbO . *Mudrasang, mudra-sankha* (F. Dose = 2 oz.) (5) **Sulphide**, PbS , *Galena, Surma*. (6) **Chromate** (chrome yellow) $PbCrO_4$.

Fatal Dose.—1 ounce of acetate. **Onset**—late.

Medico-Legal points :

1. **Toxicity of Salts**.—*In bulk, metallic lead* (chemically pure) is not poisonous, when handled or ingested. But *when finely divided*, gastro-intestinal secretions render *metallic lead* poisonous. Even $\frac{1}{8}$ gr. of Pb ingested daily causes violent poisoning. A $\frac{1}{100}$ th gr. per gallon of drinking water is also sufficient to poison, because lead is **cumulative**.

2. The **soluble** salts of lead are : acetate, subacetate, nitrate ; the **insoluble** ones are—oxide, chloride, sulphate, chromate, carbonate, sulphide. *Sugar of lead* is not an active poison

and may be given for a long time safely. Probably, the sulphide and sulphocyanide are not poisonous. Lead rarely poisons when given medicinally (as lead and opium pills.)

3. Lead is **absorbed** through skin by sweat, alimentary and respiratory passages and is **excreted** by urine chiefly and bile; also by fœces, sweat, and milk. Its excretion is slow. It tends to be *deposited* in spleen,* muscles and peripheral nerves.

4. **Sources of Lead Poisoning.**—(a) *Lead industrial occupations*: Cutters, miners, mixers, glaziers, grinders, refiners, smelters, rollers; printers, shot-makers, potters, file-cutters, coach-makers, painters, glass or copper or lacquer-workers; lace-makers; constructors of electrical accumulators; makers of—vulcanized rubber, artificial flower, enamel; barmen, fish mongers, hat-sizers. (b) *Accidental causes*: application of lead ointment, plaster, artificial teeth, hair dye, cosmetic &c.; sleeping in newly painted room; chewing silk-threads or alpaca, moistening fingers repeatedly with saliva, while dealing glazed cards. (c) *By Food or Drink*:—water or aerated water in contact with leaden or pewter stoppers, solders, cisterns, boilers, pipes; or wines, spirits, rum &c.,—from bottles cleaned with lead-shots or in contact with lead worms in the stills; or, drinks kept in vessels imperfectly burnt or porcelained or tin-lined; or, use of so-called 'tinfoil' (lead) *wrappers* upon—chocolates, loaf-sugar, tea, tobacco, snuff, tinned provisions.

5. **Water as Pb.-solvent.** Soft, ferruginous, oxygenated, aerated, acidulous (such as water running through a peaty area) and saline-free water become impregnated with lead from the glaze of the vessel in which they are kept. Pure, unærated water or water containing carbonate of lime or sulphate of lime

* Taken up as an albuminate, it circulates in the blood and checks the separation and excretion of urates and thereby causes *Gout*.

does not act on lead.—Litharge-glaze is readily dissolved by alkaline or fatty substances.

6. **Commercial Pb. preparations :** (1) From *white lead*—*pigments* and *glazes*. (2) *Turner's yellow* = oxychloride of lead. (3) So-called harmless *hair-dyes* and *lotions* contain as much as 10 gr. per ounce of Pb-acetate. (4) *Crayons*, *French chalks*, *cosmetics*. (5) *Tin-lining* (kalai) of cooking pots often is contaminated with lead. (6) Sugar of lead is added to *wines* to sweeten them. (7) Oxide and chromate are added to *snuffs*.

7. **Criminal uses of Pb.**—*Diachylon* (1 dram) & *Red lead*, are used as abortifacients. Red lead with white arsenic is also used as a cattle poison.

8. **Indigenous uses.**—*Litharge* is used as antisyphilitic, *Red lead* is smeared on abortion-sticks or used as cattle-poison, *Chromate* is used to colour confectionary ('tilgul'), the *sulphide* is used as a collyrium.

9. **Blue line in gum** = deposit in the epithelia of Pb + S (from food decomposing between gum and teeth). Hence, in the absence of teeth or where they are sound and tooth brush is regularly used, *blue lines* will not be visible. Blue line alone can exist as evidence of Pb-poisoning, just as the latter can exist without any blue line.

10. **Plumbism in husband** causes miscarriage, even though the wife is not a lead worker, and predisposes convulsion in the foetus in utero. Alcoholics, females, the young, and those that are ill are more susceptible to lead poisoning than others.

Symptoms :

(A) **ACUTE POISONING** (after taking very large quantities) :—

1. **Local :** *Taste*—Burning, sweetish, astringent. *Tongue*—is coated. *Thirst*. *Throat*—feels constricted and dry. *Blue line* in gums.

2. **Gastro-intestinal :** *Stomach* :—burning sensation. *Vomiting*—of white masses of coagulated mucus, stained with blood or not. *Abdomen* :—*Rigid* and sometimes *retracted* (∴ patient leans forward); paroxysmal *colics*—relieved by pressure. *Constipation* : fœces are black, if any are passed.

3. **Cardiac :** *Collapse*—much prostration, cold skin : *Pulse*—falls to 40, per minute during colic.

4. **Nervous :** Vertigo ; paraesthesiae, paralyses of extensor muscles ; cramps in flexor muscles.

(B) SUB-ACUTE POISONING (in lead workers) :—

1. **Gastro-enteric** :—*pain* ; occasional *nausea*. *Tongue*—is flabby ; *blue line*—in gums ; *constipation*—is obstinate. Paroxysm of violent *cramps* about navel, with retracted abdomen.

2. **Metabolic.** *Pulse* slow and feeble. *Temperature*—subnormal. *Secretions* generally—arrested. *Urine*—scanty, albuminous. *Anæmia*,—rapidly develops.

3. **Nervous :** (a) *Girdle-sensation* in loins, peripheral neuritis with convulsions, followed by *paralysis* of extensors, chiefly, of *lower limbs* ; *Cramps* in flexors and neuralgic *pains*. (b) *Giddiness*, *syncopal* tendency, followed by coma and death ; or, symptoms subside, to return long afterwards, perhaps in an aggravated form, and recovery is very slow.

Prognosis : *Kidney* disease and profound *malnutrition* are incompletely recovered from ; *palsy* is recoverable, returning on re-exposure ; *encephalopathy* is always serious.

P. M. Appearances : Gastro-intestinal inflammation, with or without ash-grey erosions.

Treatment :

1. *Eliminate*—by tube or emetics, if no vomit yet.

2. *Neutralize* (and *purge*) by—soda or magnes. **sulphate** or **carb.** ($\frac{1}{2}$ oz. doses), or (*b*) acid sulphuric dil. ($\frac{1}{8}$ dram).

Demulcents—milk, **white of eggs**.

3. *Stimulate*—and give warmth generally.

4. *For colic and pain*,—give **morphia**, or belladonna, hot **fomentation**.

4. *While recovering*,—give pot. iodide with mag. sulph.

(C) CHRONIC POISONING=SATURNISM.

Symptoms: **Onset**—insidious.

Colic: (1) *Indigestion*—with lost *appetite*, thirst, *constipation*, foul *tongue*, foetid *breath*, sweet-astringent *taste* in mouth. *Blue line* in (and not on) edge (specially lower) of *gums*, and also around *anus*. (2) *Colic*—paroxysmal, spread over whole abdomen, relieved by pressure when not violent, attended with constipation (rarely, diarrhoea), hard *pulse*; between paroxysms, there is dull heavy pain. [CAUTION:—In some cases, localised pain, increased leucocytosis and *slight fever* give appearance of localised inflammation].

Cachexia: *Emaciation & Anæmia*: haemoglobin and red corpuscles fall even below 50% and erythrocytes undergo granular degeneration (Punctate basophilia); sometimes skin is *icteroid*.

Paralysis (result of peripheral neuritis).—Its *onset* is often without fever. The paralysis may be (*a*) *generalized* and *ascending*—over whole body; or, (*b*) limited to *one muscle*; or, (*c*) affecting certain *muscle-groups* as—

(1) Anti-brachial type (musculo-spiral)=bilateral wrist drop.

(2) Brachial or Duchenne-Erb type=Scapulo-humeral.

(3) Aran-Duchenne type—affecting small muscles of hands, specially of thenar and hypothenar eminence.

(4) Peroneal type—affecting specially, lateral peroneals and extensors of big toe.

(5) Adductors of larynx—whence aphonia.

Sensation:—(a) There is little, if any, disturbance, except occasional and localized patches of *anæsthesia*. (b) *Girdle-sensation*, and *cramps* in the affected joints; (c) *Tremors* (increased by muscular effort); and *ataxia*,—often occur. *Electrical reaction* of degeneration—is generally present.

Cerebral encephalopathy (due to endarteritis of cerebral vessels) *viz.*,—*lunacy*, hallucinations, mania or excitements, dementia; hysteric, eclamptic or epileptiform seizures; trances, unconsciousness-fits; *optic* neuritis, amaurosis, neuro-retinitis, retinal hæmorrhages, or even improvement of vision.

Gout—from deposit of urates, specially about knees, elbows and shoulders and associated with decreased urea elimination—hence, headache, giddiness, insomnia, delirium at night, *crampy pain* in penis, scrotum, uterus, joints and limbs.

Other symptoms: Profuse menstruation, abortion. *Sexual* appetite is lost.* *Kidney*, contracted. *Urine*—scanty and albuminous occasionally; *Heart*, hypertrophied. *Pulse*—often of high tension and unequal at both wrists.

Diagnosis: (1) From **Appendicitis**: by—Blue lines in gums, duration of 2 to 3 days, retracted abdomen, pain being independent of Mc Burney's point, tense pulse, anaemia, apyrexia, bilateral wrist-drop, history of exposure to lead. (2) From **uraemia**: by—blue line in gums, bilateral wrist-drop.

Treatment:

1. *Remove source* of poisoning—by insisting on rigid personal cleanliness, by keeping down lead dust, by avoiding leaden pipes and cisterns &c. Secure good hygiene.

2. *Eliminate* by *purgative*—blue pill at night and saline sulphates in the morning.

3. *For colic*—mag. sulph., castor oil or olive oil or even morphia and atropin or mono-sulphite of soda (gr. x, t. d.) *For vomiting*,—effervescing bromide or belladonna mixture.

4. *For paralysis and wasting*: pot. iod. with mag. sulph.; and intramuscular injection of strychnine, hot bath, massage, faradisation, passive movements. [Pot. Iod. should not be given until all the metal is removed from intestines].

5. *For anæmia*:—syr. ferri iodide, bone-marrow, cod liver oil, port wine, Parrish's chemical food.

6. *For 'epilepsy' or 'hysteria' and for kidneys*—give plenty of diluents, pilocarpine hypodermically, or saline injection or give to inhale, amyl nitrite—to secure urea elimination.

P. M. Appearances: *Muscles*—are flaccid, of cream colour, with fatty degeneration. *Spleen* shows deposit of lead.

Prognosis: Doubtful. Recovery is slow.

Separation & Tests: (1) Add to the organic liquid, HNO_3 , boil and filter; $+\text{H}_2\text{S}$ =black ppt. If no ppt. falls, collect the solid matter from filtrate, incinerate it; to ash add HNO_3 + heat. Then digest it with water and pass H_2S into it=brown or black ppt., soluble with difficulty in acids (2) Pb salt + KI=bright yellow ppt., sol. on boiling and re pptd. on cooling. (3) Pb salt + H_2SO_4 =heavy white ppt., sol. in NaOH.

COPPER, Cu., *Tānbā, Tāmra*.

Forms:—(1) Sulphate, CuSO_4 , Blue-stone, Blue-vitriol, *Nil-tutia* (2) Subacetate=*Zangal, Pitra, Kalanka*=artificial verdigris. [The Carbonate is called the natural verdigris.]

F. dose: 1 oz. **F. Period**: 4 hours (children) 3 days (adults).

A.—ACUTE POISONING.

Symptoms. Onset almost immediate (15 minutes).

1. **Gastro-enteric**: Strong metallic taste in mouth;—*saliva*—

tion; nausea, vomiting (bluish or greenish); epigastric pain, griping and meteorism. *Stools*—glairy, mucous, bloody. *Jaundice*—after 24 hours. Constriction of *throat*, expectoration freely.

2. **Nervous** : Headache, giddiness, paralysis, convulsions, anæsthesia, coma.

3. *Respiration*—quick and difficult. *Heart* depressed : \therefore , *syncope* ; *Skin* cold and clammy. *Urine* scanty (black) or suppressed.

Treatment : Be quick !

1. *Secure emesis*—by tube or apomorphine.
2. *Precipitate* the metal by—**albumen** of egg.
3. *Neutralize*,—by frequent doses of—**pot. ferrocyanide** (1 dram) in a tumblerful of water ; or iron-filings.
4. *Relieve pain*, by—**morphia** or tr. *opii* and fomentation.

P. M. Appearances :

1. *Gastro-intestinal* inflammation, corrosion, submucous ecchymoses, perforation. Fatty degeneration of *liver*.
2. Blue or green *pigmentation* of alimentary tract, deepened on adding NH_4OH . *Yellow tinge* of whole body.

B. CHRONIC POISONING. ('Copper colic')

Symptoms :

1. Constant coppery *taste* in mouth. Purple or green line in *gums*.* *Salivation*. Greenish *vomit*. 'Dyspepsia' ; *Diarrhæa*, *colicky pain* in bowels ; straining at stool. *Jaundice* : *skin and hair*—coloured greenish.
2. *Pharyngeal and bronchial catarrh* : cough.

* If in the *gums* there is a line which is in colour—
 Green—it indicates copper
 Purple—,, ,, copper.
 Blue—,, ,, lead, mercury, silver.

3. *Anaemia* ; Headache, *wasting*. Fatty *liver*.

4. *Nervous* : *paralyses*, tremors.

Treatment : Avoid source ; treat symptoms ; good hygiene.

Medico-legal points :

1. **Diagnosis from other metallic irritants** : (1) Coloured vomit, the colour of which is deepened by NH_4OH (*vs. Bile*). (2) There is no combination of acute colic, constipation and paralyses (*vs. Lead*). (3) Jaundice present (*vs. As, Hg*).

2. **Toxicity of Copper**. Pure *metallic* copper *in bulk* is not an active poison. *Small doses* of metallic copper and *organic compounds* of it, are more dangerous than inorganic ones. Pure water has no action on untarnished copper ; but water (holding in it heat + oxygen), or *salines* (specially NaCl) and *fats*, or *acids*, do act on copper.

3. It tends to be **deposited** in stomach, liver, intestines, bones and all tissues, and is **eliminated** by bronchi and urine. It is not universally agreed that copper in minute quantities, is a constituent of human body.

4. **Criminal uses of Cu**.—as a cattle poison, as an abortifacient.

5. Copper is very often **contaminated** with arsenic. **Brass** is an alloy of zinc and copper ; brass-founders occasionally suffer from a sort of 'ague.' **Bronze** = $\text{Cu} + \text{Sn}$.

6. **Commercial uses**.—*As* (fresh) green *colouring* for sweets, pickles and other preserved edibles ; for seeds, artificial flowers ; as green wrappers for food ; to bread it is added *to whiten it* ; *As alloy* in dentist's *inferior gold*. *As pigments* : green verditer, blue verditer, Brunswick green.

7. **Sources of chronic poisoning**—(a) By skin and lungs : in workers in metallurgy of copper or of copper printing.

process. (b) Drinking frequently of *arrak* (liquor) contaminated with copper. (c) Use of plates of inferior gold for artificial teeth.

8. Most acute cases are accidental or suicidal. **Homicide** is not common, because copper compounds possess strong metallic taste and colour. **Accidental** poisoning occurs from badly tin-lined cooking pots, ingestion of copper salts to procure abortion, use of 'german-silver' articles for taking acids, taking brilliantly-green-coloured preserved-edibles.

[It is doubtful whether there is or is not a chronic copper poisoning among workers in that metal. Perhaps most, if not all of the symptoms of chronic poisoning are due to the local action of the copper dust on the various mucous membranes. According to French and Belgian authorities, no poisoning is produced by habitual eating of edibles brightly coloured with copper.—Wood.]

Tests : The suspected article is invariably blue or green
 (1) A fine iron-wire gets a deposit of copper, if it is inserted into the liquid. (2) Filter the suspected liquid treated with H_2SO_4 dil., and boil the filtrate on a platinum crucible with pieces of Zn. = copper is deposited on platinum. This can be dissolved out by HNO_3 and tested. (3) $Cu + NH_4OH$ = light ppt., sol. in excess. (4) $Cu + NaOH$ = light blue ppt., insol. in excess and blackened on boiling. (5) In Organic combination: To ash of incinerated organic matter, add HNO_3 ; reincinerate and add HCl ; filter and test as above.

SILVER NITRATE, "LUNAR CAUSTIC."

Used in—surgery, photography, hairdye, marking inks.

Fatal dose—50 gr. or less. **F. Period**—over 6 hours.

Symptoms.

Acute :—Corrosion (in white patches). Pain and irritation* in *mouth, throat and stomach*. *Vomit* at first white, blackening on exposure to light.

Chronic : Black 'pigmentation' by silver salts ("Argyria") hence, skin is greyish or black in colour. Blue line in *gums*. *Albuminuria*.

Treatment.

1. *Evacuate* by tube (with care) or emetics
2. *Neutralize*, by **table salt** (2 dr.) in milk, followed by
3. *Demulcents*—egg albumin, gruel, barley water &c.

Tests : (1) + H_2S = black ppt. (2) + NH_4OH = brown ppt. sol. in excess of reagent. (3) + HCl = white ppt., insol. in HNO_3 . (4) + Zn foil = arborescent deposit of Ag.

PHOSPHORUS, P.

Forms : (1) Crude, soluble or *yellow* (very dangerous). (2) *White* (dangerous). (3) *Red*, insoluble or amorphous phosphorus (innocuous).

Fatal dose : Gr. $\frac{3}{4}$ to 2 (about 3 to 8 dozens match-heads)* Even gr. $\frac{1}{8}$ has killed an adult. [B. P. dose = $\frac{1}{100}$ to $\frac{1}{50}$ gr.]

Fatal Period :—A few hours to a fortnight or month.

Sources : (1) Eating "*vermin destroyers*" or "rat pastes" ($\frac{1}{8}$ to 4 %). (2) Sucking the *head of matchsticks*. 3. Working in phosphorus *fumes*. (4) *Application* of phosphorus.

A. ACUTE POISONING, by *eating* phosphorus.

Symptoms. Onset :—within $\frac{1}{2}$ to 4 hours.

* *Non-'safety'* MATCH-STICK HEADS are tipped with a composition containing 15% white phosphorus, powdered glass, antimony, potassium chlorate etc., and the *rubbing surface* is a mixture of amorphous phosphorus, antimony and glue. 'Safety' matches contain no P.

† RAT-POISONS may be composed of (1) arsenic, (2) phosphorus, (3) barium carbonate (witherite) or (4) root of bhool-dori* (tylophora fasciculata). The phosphorus rat *paste* = yellow phosphorus + fat + sugar + flour + colouring matter.

I. Primary or Immediate (=Gastro-intestinal) :—

1. *Taste*—garlicky.—*Breath* exhales odour and is luminous.
2. *Vomiting*,—severe and persistent, soon becoming bloody, green or black, and luminous in the dark, with odour of garlic. *Interfse* thirst and *eructations*.
3. *Pain* in gullet and stomach. *Abdomen* is distended. *Constipation* is the rule. *Stools* are phosphorescent.
4. Collapse, *Delirium*, *convulsion*, ending in death :—

Or, after some hours (4—8), the irritant symptoms subside for 1 to 3 days, with perhaps, only nausea, thirst and tender abdomen, when,—

II. Secondary Symptoms appear (5 groups) :

1. *Vomiting* of altered blood (like 'coffee-grounds'). *Jaundice*—intense and lasting for months, *Thirst*. *Abdomen*—distended ; paroxysmal *cramps*. *Stools*—liquid (diarrhoea), whitish or bloody, phosphorescent. *Liver* and spleen—are enlarged and tender. Liver contracts, if patient lives long.
2. *Hæmorrhage*—from mouth, bowels and genito-urinary organs (∴ priapism) ; under skin (purpuric spots) ; into spinal cord (∴ paralyses) and into placenta (∴ miscarriage). Severe *anæmia*.
3. *Urine*—suppressed or scanty ; often albuminous, bloody, bile-stained ; and contains excess ammonia, sugar, casts, and occasionally, sarco-lactic acid, leucin and tyrosin. Immediately before death, urea is increased.
4. *Heart*—is markedly depressed, and its muscles undergo degeneration. *Pulse*—feeble, rapid, thready ; hence,—faintness, lividity, coldness of extremities. *Temperature*—rises, sinking towards the end.

5. *Nervous symptoms* : headache, sleeplessness, restlessness and delirium. Thick speech, muscular twitchings, convulsions and coma usually precede death, which may occur also from failure of heart or respiration. Mind remains clear sometimes.

Anomalous cases : (a) sudden, *rapid death*, without jaundice ; or (b) vomiting, pain and tenderness over abdomen, cardiac prostration, *paralysis* of legs ; or (c) *pseudo-menstrual discharge*, with abortion and structural changes in foetus, similar to those in mother ; (d) *onset of symptoms* may be delayed to nearly a week.

Duration (approximately) of

Stages	{	<i>1st Latent</i> — $\frac{1}{2}$ to 4 or even 12 hours
		<i>1st Stage</i> —4 to 8 hours or more.
		<i>2nd Latent</i> —2 to 4 or more days.
		<i>2nd Stage</i> —A few hours to 7 days.

Medico-legal points.

1. **Accidental poisoning** may occur *in females* taking P to procure abortion ; or *in children* by their sucking match-stick heads ; and *in adults males* from absorption of bits of P embedded under nails or skin ; also from taking **suicidally**.

2. **Recovery** after taking 5 grains is on record ; it may occur unexpectedly even in the worst cases, leaving digestive and nervous systems damaged for good.

3. As phosphorus is rapidly oxidized in the tissues, it may be entirely **absent from viscera**, if examined late. The presence of **phosphates** does not prove poisoning by phosphorus.

4. **Phossey jaw**—is commoner in persons with bad teeth than in those with sound teeth.

5. Tetrachloride of Ethane.—Inhalation of its vapour, during use of "Emaillite" varnish, produces SYMPTOMS similar to those of P. poisoning, *viz.*, jaundice, fatty degeneration of liver tissue, etc.

Diagnosis :

Acute yellow atrophy

1. Develops slowly
2. Symptoms more or less persist throughout.
3. Liver is primarily small.
4. Leucin and tyrosin in urine
5. Gastric symptoms less marked.

Phosphorus poisoning.

1. Develops abruptly.
2. Complete lull of symptoms occasionally.
3. Liver enlarged.
4. Not always present.
5. More marked.

Prognosis—Bad, specially if purpura and jaundice are present. Temporary cessation of symptoms is suspicious.

Treatment. Avoid oils !

1. *Evacuate very thoroughly* by—pump or emetics, specially by—**copper sulphate**. *Purge*—by magnes. sulph ; *never give castor oil*.

2. Neutralize by (a) *Oxidisers* like—**old,* unrectified Turpentine** (in 40 minim doses) with or without *hydrated magnesia* ; *Pot. permanganate* ($\frac{1}{8}$ to 1 % solution) ; *Sanitas* in emulsion (4 doses during first hour, then 3 times a day, till recovery) ; or (b) by **Copper Sulphate** (gr. 3 in Aq. 6 oz.), every 5 minutes till vomiting ; then every 15 to 30 minutes. [Cu + P=insoluble black phosphide of copper.]

* This turpentine is variously called—old, unrectified, oxidized, acid, French, commercial spirit of Turpentine (1 dram to a pint) ; *avoid*—the turpentine known variously as—American, German and rectified. *One part old turpentine is necessary for 0.01 part of P.* It should be given in mucilage for several days to keep bowels acting.

3. *Use demulcents.* 4. *Ease pain*—by morphia hypodermically. 5. *Stimulate*,—by spt. ammon. aromat., digitalis.
6. If P burns the skin, dissolve it out by CS₂ or pure ether.

P. M. appearances :

I. In deaths within 24 hours : [*There may be nothing characteristic*]*—Mucous membrane of Stomach*—is yellowish or greenish-white ; inflamed, shed in places ; or reveals ecchymoses, gangrene etc. Its *contents*—smell of garlic, are luminous in dark ; may contain white vapour. [*Rarely, liver shows advanced fatty degeneration.*]

II. In deaths after some days :—

1. *Liver*—enlarged (and in advanced fatty degeneration).
2. *Spleen*—Congested, enlarged.
3. *Heart and other muscles*—show fatty degeneration.
4. *Kidneys, Gastro-intestinal mucosæ* :—fatty degeneration.
5. *Blood*—dark, coagulable and suffering in its corpuscular elements ; there are capillary thrombosis, purpuræ and ecchymoses into cellular tissue of chest, abdomen etc., or under serous and mucous membranes.

B. CHRONIC POISONING (from *inhaling* fumes) = “lucifer disease” or “phossy jaw.”

Symptoms :

1. *Gastro-intestinal irritation*—nausea, eructations, epigastric heat ; tenesmus, diarrhoea.
2. *Periostitis* and necrosis of lower jaw (“Phossy Jaw”).
3. *Respiratory irritation*—bronchitis.
4. *Cachexia* : General malnutrition, hence, spontaneous fracture of femur (fragilitas ossium).

Treatment : (1) Ensure—free *ventilation*, periodical *examination of teeth* and gums, enlistment of only *those who*

have good teeth and substitution of more red for other varieties of phosphorus (2) Treat local symptoms *surgically*—and avoid further exposure to fumes.

Separation & Test : (1) By washing and melting ; (2) by dissolving out with CS_2 . (3) By Mitscherlich's Process (when P is in tissues) : Distil to dryness, after acidulating the substance by H_2SO_4 and conduct the vapours through cooled tubes in dark = luminosity appears. {Presence of turpentine, alcohol, ether, metallic sulphides etc. prevents luminosity} (4) Lipowitz's process (if P is in organic matter) + $\text{H}_2\text{SO}_4 + \text{S}$ + boiling ; the washed distillate shows luminous bits of sulphur ; or, add HNO_3 and test for Phosphoric acid. (5) Green colour to hydrogen flame, when this gas is conducted through a solution containing it, before being burnt (Modified Marsh). Phosphorescence can be developed in the dejecta by adding to them heat and H_2SO_4 .

BORAX, BORIC ACID. H_3BO_3 .

Source.—Absorption of lotions retained in body-cavities.

Symptoms : Severe vomiting, hiccup ; delirium ; erythematous rash ; fall of temperature, fatal collapse.

Treatment—Demulcents, stimulants, warmth, etc.

POTASSII CHLORATIS. KClO_3 .

F. Dose : Over 6 dr. **F. Period :** over 6 hours.

Symptoms : (1) *Gastro-intestinal* irritation. (2) Free destruction of *red corpuscles* and increase of *white corpuscles* ; hence—*blood* is brownish ; *jaundice* ; *urine* contains—albumin, hæmoglobin, hæmatin. (3) *Somnolence*.

Treatment : Evacuation. Diuretics. Treat symptoms.

ALKALINE & EARTHY SALTS.

Forms : Magnes. Sulph. or Epsom Salt [*resembles oxalic acid, zinc sulphate, zinc chloride*]. Potassii Bisulph., Sal Poly-

chrest or Sal de duobus, *F. D.*, 2 oz. **Pot. Chloride**, *F. D.*, 1 oz. **Pot. Nitrates**, Nitre, Saltpetre, Sal prunelle, *Sora, Sora-Kshar, F. D.*, 1 oz., *F. Period*, 3 hours or more. (5) **Sodii Chloride**, *Laban, Noon, Neemuk, F. D.*, $\frac{1}{2}$ lb.

Note. *All the salines, if they fail to exert their natural emetic, laxative, diuretic or diaphoretic actions, after absorption, act as poisons to all parts of the body where the circulating blood takes them to (e.g., heart, spine etc.) Hence,*

Symptoms : (1) *Gastro-intestinal irritation [may be absent].* (2) *Cardiac*—depression, with cyanosis, syncopal tendency. (3) *Spinal and neurotic irritation* (convulsions, twitching) followed by paralysis—aphonia, coma etc. (4) *Muscular poisoning*—severe prostration (5) *Renal inflammation*, with suppression of urine.

Treatment : Recumbency, Emetics, **Cardiac** stimulants, warmth, demulcents.

ZINC, Zn. *Jasta, Dasta.*

Similar action of—Manganese.

Forms : Sulphate, ZnSO_4 , white vitriol, white copperas, *safed-tutia*. Chloride, ZnCl_2 , Oxide, Zn O . *Dasta Bhasma*, putty.

Fatal Dose : (1) *Zinc Chloride*, gr. 12. (2) *Burnett's Fluid*—drams iv. (3) *Zinc Sulphate* = $\frac{1}{2}$ oz. or more.

Symptoms : (if poisoned by chloride).

1. **Gastro-intestinal :** *corrosion* of lips, mouth and larynx dyspnoea, bloody vomit; tender stomach. Colic and *Diarrhoea*.

Nervous : Weakness, paralysis of, or cramps in, muscles; or, convulsions; impairment of special senses, e.g., sight, taste

and smell. *Pupils* dilated. Small rapid *pulse*. *Collapse* and coma.

Treatment. (Avoid *emetics* or *stomach tube*.)

1. *Demulcents*. 2. *Stimulants*.

3. *Neutralize* the chloride, by **carbonate** of magnesium, sodium or potassium (30 gr. in a pint of water) or **tannin**.

4. *Ease pain*—by morphine and hot stupes to abdomen.

P. M. appearances of ZnCl_2 poisoning :—*Gastro-intestinal tract*—bleached white, abraded, inflamed. Stomach is perhaps perforated. Strictures form, if patient recovers.

Chemical Notes : (1) Zinc **Sulphate** (emetic dose, $\frac{1}{2}$ dr.) and **Acetate** (emetic dose, 10 gr.) are both emetics, which so completely get themselves thrown up, as rarely to cause poisoning. They are absorbed when, in opium or other kindred poisoning, emetic dose after dose is given, without producing vomiting. (2) The **Chloride** alone is corrosive; the others are irritants. The chloride is sold as Burnett's Disinfecting Fluid (200 gr. per oz.) (3) The Sulphate resembles Mag. Sulph.; and Burnett's Fluid resembles Pale Ale, Fluid Magnesia, Mineral waters. (4) The Sulphate is non-corrosive. **Chronic poisoning** may occur from using impure cooking utensils.

Tests : (1) Neutral or alkaline Zn salt + H_2S = white ppt.
(2) + KOH = gelatinous, opalescent ppt., sol. in excess of KOH .
(3) K_2FeCy_6 = yellow gelatinous ppt.

CHLORINE GAS.

Similar action of—Liqr. sodae chlorinatae, Nitrous Acid.

Symptoms : (1) *Inflammation of air passages*—∴, spasmodic cough, violent *dyspnœa* and dysphagia. (3) *Conjunctival irritation*. (2) Intractable broncho-pulmonic trouble.

Treatment : Inhalation of fresh air, steam, chloroform and very dilute ammonia, or H_2S .

Commercial uses of Chlorine :—(1) As *disinfectant* [Liquified Chlorine is also sold.] (2) As *Bleaching powder* = $\text{Ca Cl}_2 + \text{Ca (Cl O)} + \text{Ca O}_2 \text{H}_2$.

BROMINE, Br.

Forms and Dose.—(1) *Liquid Bromine* (1 oz.) (2) *Bromine gas* [from Bromides + acids] (3) *Bromides* ($\frac{1}{2}$ oz ?)

Symptoms :

A. **Liquid Bromine** acts as a corrosive, see pp. 184-185.

B. **Bromine Vapour**—acts like Chlorine.

C. **Bromides** : I. **Acute Poisoning** :

Symptoms :—(1) *Muscular weakness*. (2) *Cardiac prostration*— \therefore , *Pulse* is slow, irregular. (3) *Frontal headache*. (4) *Insensibility*. (5) *Aphasia*. (6) *Amnesia*.

Treatment : [*Emetic is useless, unless given immediately.*]

(1) *Dilute* with large quantities of water, followed by small quantities of *very weak alkalies* (which should be *evacuated* quickly), till acid reaction disappears.

(2) *Precipitate* with **Carbolic Acid**, (=tribromophenol,) which also should be *evacuated* quickly.

(3) *Stimulate* by alcohol, ammonia, hot coffee and 2 doses of **strychnine** $\frac{1}{8}$ gr. each, within an hour.

II. **Chronic Poisoning** = "Bromism". (1) **SYMPTOMS** :—*Skin eruptions*—acne-like, or pustular,—on face and back. *Cutaneous sensibility*—lowered. (2) General muscular *prostration*, weakness, staggering gait. (3) *Conjunctivitis*. (4) *Pharyngeal reflexes*—abolished. (5) *Bronchial secretions*—increased. (6) *Sexual functions*—impaired. (7) *Mental dullness*, even melancholia, dementia etc. 8. *Drowsiness*.

TREATMENT :—(a) Stop use of bromides. (b) Give with food and drink, extra quantities of sodium chloride and water. (c) Give strychnine and atropine. (d) Give boric acid fomentations to allay rashes.

Medico-legal points :

1. Bromides should never be given for a long time to the anæmic nor to children, who get toxic from small doses.

2. **Caution**.—Do not continue *pot.* bromide in cases where kidneys are not functionally sound, or where the heart is depressed or “palpitates.” Where the bromides disagree, they cause nausea and colic.

3. If strychnine is prescribed with bromide in a mixture, that mixture should not be taken without shaking the phial, as it may be fatal to do so ;—because, the strychnine that was intended to be spread over so many doses, is thereby, drunk in one dose on account of its falling in a lump to the bottom.

4. Secret remedies for ‘fits’ contain bromides.

Test : (1) To₂ suspected liquid + *pot.* bichromate + H_2SO_4 and distil = *bromine*. Then $Br + AgNO_3$ = yellowish white ppt., which is insol. in HNO_3 and sparingly soluble in NH_4OH . (2) Suspected liquid + $Cl + H_2O$ = *Bromine* liberated, which may be dissolved by shaking with CS_2 or $CHCl_3$.

IODINE, I.

Forms :—(1) Tinct. ($2\frac{1}{2}\%$) or Lint. Iodi. (10%) = Liqr. Iodi Fort. (2) Pot. Iodidi. (3) Iodoform, CHI_3 , (96.7%.)

Fatal dose— $\frac{1}{2}$ dram, or more of Iodine pure.

Symptoms of—

I. **Acute Iodine Poisoning** = PURELY IRRITANT :

(a) *Gastro-intestinal tract* :—burning pain in œsophagus and stomach, with painful, brown eschars or even corrosions.

thereof. *Vomit is blue* (if starchy food was present), or *yellow* (if stomach was empty) or *black* (if blood is extravasated); vomit may persist for some days. *Stool*—is bloody; hence, bad depression, thready pulse, general deadly pallor.

(b) *Air passages*—irritated, with : swelling of larynx, spasm of glottis. Therefore,—cough, increased flow of mucus, *Convulsions*.

(c) *Renal irritation* : *Suppression of urine*, or bloody urine; excitement of genitals, abortion. (d) *High fever*.

(e) *Remotely*—iodism. *Eruptions*—pemphigoid in mouth, nose, throat, larynx and purpuric on legs.

II. Iodides :—Symptoms of Chronic poisoning—"Iodism."

1. ALIMENTARY : (1) *Metallic taste* in mouth,—constantly felt; *nausea*; furred tongue, loss of appetite, or *bulimia*. (2) *swollen gums*; *salivation*, (3) *Enlargement of liver*. (4) *Diarrhæa*.

2. NERVOUS : *Neuralgia*, *convulsion*, ringing in ears, atrophy of *breasts* and *testicles*; *cutaneous eruptions* (purpuric); *disturbed intellect*.

3. CACHECTIC : *Rapid emaciation*; *fever*.

4. CATARRHAL : *Running* of the eyes (with sneezing); *œdema* of fauces and around the eyes, frontal headache; irritation of *fauces*, *trachea* and bronchi. Albumen in *urine*, *poly-urea*.

III. Iodoform Poisoning :—

(a) *Acute* :—(1) *Burning pain* in *stomach*. (2) *Headache*, giddiness, confusion of ideas; faintness, *delirium*, insensibility. (3) *Convulsion*, general *paralysis*. (4) *Collapse*.

(b) *Chronic poisoning* :—(1) *Malaise*, *gastrointestinal disturbances*. (2) *Vertigo*, dilatation of *pupils*, *delirium*.

- (4) *Mania or melancholia*. (3) Rise of *temperature*. (5) Fatty degeneration of *liver and muscles*. (6) *Hæmaturia, albuminuria*. (7) *Coryza* and failure of *vision*. (8) *Erythema*.

Treatment of Iodine, Iodoform & Iodides :—

1. *Evacuate*,—by tube or apomorphine. *Eliminate*—by diluents and diaphoretics, hot sponging, cupping over kidneys.

2. *Neutralize Iodine*—by Liqr. Calcis Sacchar., demulcents and **Starch** (wash stomach out thoroughly after each dose of starch).

Neutralize Iodoform by—**sodii bicarb.** (2 drams) every hour ; **plumbi acetas** (2 drams) or other diuretics.

3. *Keep alive*,—by stimulants injected hypodermically.

4. *Relieve pain*,—by morphine hypodermically.

Medico-legal points :

1. **Iodism** (from taking iodides internally or applying iodine preparations externally) is produced oftener by small doses than by big doses; it can be *prevented* by increasing the dose or by giving iodides in milk or with nux-vomica, arsenic or ammonia. Owing to **idiosyncrasy**, death has occurred from 12 grain doses, although 100 gr. per diem are tolerated easily by others and a child has died of purpura after having $2\frac{1}{2}$ grains.

2. **Iodoform**, if inhaled for a long time, brings on *unconsciousness*. Picric acid is used as an *adulterant* of iodoform.

3. In iodine poisoning, **sudden death** may occur, during convalescence, from heart-failure.

Tests : (1) *Iodoform* : $\text{CHI}_3 + \text{HNO}_3 + \text{CS}_2 = \text{rose or violet-red colour}$. (2) *Iodine* : To suspected liquid + $\text{CS}_2 = \text{rich pink colour}$. Decant the watery liquid from the sulphide and evaporate to dryness = iodine crystals. I + starch = blue colour.

POWDERED GLASS.

Similar action of—Pins, needles, powdered diamond, &c.

Symptoms—depend on (a) state of *division* of glass and (b) *empty or full* condition of stomach. They are—

1. Rough, gritty *sensation in mouth* (if given by itself.)
2. *Gastro-intestinal* irritation, with gripes. 3. *Collapse*.

Treatment.

1. **Bulky foods** (pulp of ripe plantain, potato, bread &c.) or, *thick*, demulcent drinks—gruel, mucilage, egg-white ; then,
2. Emetics, stomach-tube;—**Castor oil** purge. 3. *Stimulants*.

Medico-legal point : Powdered glass is an unwholesome thing, deleterious to the human system to swallow, and, as such, is a poison. [I. P. C. § 324, 326, 328.]

CROTON OIL.

Purging nut, *Joy-pal*, *Jamalgota*, *Nervalum*.

Oil from the seeds of *croton tiglium*, **N. O.**, Euphorbiaceæ.

Similar action of (a) bulbous root of *patal* or *pulbul* (*trichosanthes dioica*), (b) *hydragogue* and *drastic cathartics*, (c) plants of Nat. order *cucurbitaceæ*, *euphorbiaceæ*, *ranunculaceæ*, *convolvulaceæ*, *liliaceæ*.

Fatal dose : *Oil* 15 to 30 m. ; *seed*, 5 gr. [B. P. dose = m $\frac{1}{2}$ to 2.]

Fatal Period : 4 to 5 hours.

Symptoms :

1. *Gastro-intestinal irritation* : colic, bloody vomit and stool ; tender abdomen. Pain at *fauces* and *anus*.
2. *Urine* is suppressed or diminished.
3. *Collapse* ; cyanosis, dyspnoea, pulse imperceptible, surface cold and clammy.

Treatment

1. *Wash out* stomach (cautiously) with—
2. *Demulcents*—egg-white, milk &c., bismuth.
3. *Stimulate* by—brandy, ammonia, Rubini's **Spt. camphor** (10 m. every 15 minutes, till 1 dram has been taken.)
4. *For pain and purging*,—morphia, and fomentations.

Medico-legal points.

1. **Medicinal doses of some indigenous plants** : *Bag-bharenda seed oil* (*Jatropha curcas*), 12 to 16 m ; *lanka-seej juice* (*euphorbia tirucalli*), 1 to 4 m ; *mansa-seej juice* (*e. neriifolia*) 21 gr.

2. **Castor seed**, *Ricinus communis*, *Erandi*, *Bharenda*, *Arandi*, *Amanakkam*, *Eramudapu*. **FATAL DOSE** : 3 to 10 seeds. **FATAL PERIOD** : 48 hours. Each seed = $\frac{1}{100}$ gr **ricin** (resembling abrin) and causing violent gastro-enteritis, but no purging. *Castor oil* occasionally produces choleraic symptoms, from containing excessive acid-principle from the beans. **Physic nuts** are *Jatropha curcas* (*Gab-bharenda*, *Bag-berenda*, *Moghli erendi*, *Kattamanaku*), *J. glandulifera* (*Lal-bharenda*, *Velaty erand*, *Udalai*), *J. multifida* ;—their oil is poisonous.

3. Very large doses of croton oil may be safe from being promptly and thoroughly ejected. It is often *adulterated* with castor oil ; hence, so-called large doses have not been fatal.

PILOCARPINE.

Active principle of leaves of *Pilocarpus jaborandi*, **N. O.**, **Rutaceæ**.

Symptoms : *Onset*—within 15 minutes.

(A). Acute Poisoning.

1. *Gastro-intestinal* irritation, with cramps in abdomen.

2. Sweat, salivary, gastric, urinary, bronchial, nasal, lachrymal, pancreatic—all these *secretions* are increased. [But the amount of *perspiration* bears an inverse ratio to salivary and urinary secretions.]

3. Diplopia and contracted *pupils*. 4. Redness of *skin*.

5. *Cardiac* exhaustion and pain. *Breathing* is slowed.

(B) **Chronic poisoning** (from continuous use as eye drops).

Tremor. Palpitation. Nervousness and excitement.

Treatment. Emetics, Tannic Acid, Stimulants : Atropine.

VERATRINE OR CEVADIN.

Active principle from the fruit and seeds of *Sabadilla* off., or *Schoenocaulon* (*Asagroe*) off. Nat. Ord. : Liliacæ.

Fatal dose : Bigger than the *medicinal dose*, gr. $\frac{1}{12}$ – $\frac{1}{8}$; roots of *verat. alb.*,—18 grs. [*Seed*=0.3% veratrine].

Symptoms.

1. *Gastro-intestinal irritation* ; *Salivation*. Epigastric pain.

2. First *stimulation* (\therefore pricking sensation), then paralysis (\therefore numbness) of *sensory nerves* of fingers, toes and joints.

3. *Muscles* : Their contraction is enormously prolonged. *Heart*—is first slowed, later quickened. *Vasomotor System* is powerfully depressed : profuse sweating, collapse.

Treatment : Recumbent posture, with head low.

1. *Evacuate*—by stomach tube, but use no emetic. Stop vomiting anyhow—by opiates *per rectum*.

2. Stimulate—by strychnine (hypod.) or brandy, whiskey or spt. ammon. aromat. (without water) by mouth. Warmth.

Toxicology.—*Veratrum album* is very poisonous, causing violent abdominal pain and diarrhoea, which are rare with *verat. viride*. There are 6 alkaloids in *verat. viride* and *alb.* : rubi-jervine (*vera*

troidine), jervine, pseudo-jervine, cevadine, veratrine, veratralbine. "Commercial" veratrine = cevadine + cevadilline + veratrine. It is the safest of cardiac depressants.

Tests : To extract by Stas' process—(a) + HCl + boiling = fine red colour ; (b) + cold H_2SO_4 = change of colour—yellow, orange, red ; + bromine-water = purple colour ; (c) + sulpho-molybdic acid = no change of colour.

COLCHICUM (Meadow Saffron).

Active principle—Colchicine,—obtained from corms and seeds of *Colchicum autumnale*, **Nat Ord.**, Liliaceæ.

Fatal doses : of *colchicine*—1 grain ; of *corm* 50 grs. ; of *vinum*— $\frac{1}{2}$ to 1 ounce. **Fatal Period :** 24 hours.

Symptoms : Brain unaffected. *Gastro-intestinal irritation* : collapse, anuria. *Respiration* slow and laboured. *Pupils* dilated.

Treatment :

1. *Evacuate*, (if none) by emetics or tube and *purgatives*—in both cases, with very copious warm water.
2. *Neutralize*,—by (a) $\frac{1}{2}$ dr. **tannic acid** at first ; (b) at a later stage—by demulcents, (oil, barley water etc.)
3. *Check vomiting, purging*, (if excessive) and *pain* by—*morphia*. For *collapse* : stimulate.
4. For *Anuria*, cup over kidneys.

Medico-legal points : 1. *All parts of the plant are poisonous.*

2. *Quack gout-remedies* contain colchicum.
3. **Selective Action :** Even when given hypodermically, the force of colchicine is chiefly expended on *alimentary canal*.
4. Some think that **colchicine** is inert until converted in the system into oxy-di-colchicine.

5. **Hermodactyl** (the root or bulb of *Iris tuberosa* or *Colchicum luteum*, *Surinjan-i-talkh*, (the bitter variety) is in India used in gout, rheumatism, torpid liver, and dropsy. It is very depressant.

Separated by Stas' process, with CHCl_3 .

Tests : (1) + HNO_2 = violet colour, changing to brown. (2) + ammonium vanadate + H_2SO_4 = green, changing to brownish-violet colour. (3) Zeisel's test : boil in HCl + Fe_2Cl_6 = green colour ; agitate in CHCl_3 = brownish or granite-red ppt.

ANACARDIACEÆ GROUP.

(1) **Marking nut**, *Semecarpus Anacardium* (root-bark, unripe pericarp), *Bhela*, *Bhilawa*, *Bibbu*, *Shen Kottai*, *Nallajiri*. (2) **Cashew Nut**, *Anacardium Occidentale* (unripe pericarp) *Kaju*, *Hijli-badam*, *Kothai-mundiri*. (3) **Rhus Acuminata** vel *Succedanea* (root-bark), Sweet sumach, *Tratraka*, *Tatree*, *Arhol-rikul*. (4) *Rhus Radicans* vel *Toxicodendron*, Poison Ivy (leaves) [Similar actions of juices of (a) *Hippomane mancinella*, *Jatropha urens*]. [We take Marking Nut as type].

Fatal dose—of *Bhela* juice : 100 grains.

Symptoms : [*Ripe* nut is edible, after cooking.]

Applied Locally :—Causes intense pain, swelling, black vesication (the serum of which causes eczematous eruption on any part coming in contact with it) or erythematous, painful eruptions or sores.

Taken Internally (raw)—severe gastro-intestinal irritation, with collapse, anuria or bloody urine.

Treatment :

1. *Evacuate*, by emetics or tube (cautiously).
2. Demulcents, specially, oils freely.
3. Stimulants, warmth, Saline injection.

4. **Locally**, lead lotion, bromine oil (1:32), black-wash, sod. hyposulphite sol. (1:8), boric lotion (saturated).

Medico-legal points.

1. By **malingerers**, marking nut juice is used to produce artificial ophthalmia, skin diseases or bruises.

2. **Abortionists** use marking-nut-juice locally and internally.

3. Marking-nut-juice is an indigenous **remedy** for nervous diseases, syphilis or scrofula. *Medicinally*, $\frac{1}{2}$ dram of the juice can be given with a pint of milk or a tablespoonful of clarified butter or fat.

4. *Exposure to vapour* of the juices or to pollen produces irritant symptoms.

5. Unripe pericarp of marking nut and cashew nut and root bark of the former **contain** (a) anacardic acid and (b) cardol.

Tests. Alcoholic solution of juice + KOH = bright green (Bhela) or reddish-brown (Cashew nut).

A KANDA.

Swallow wort, *Madur, Arka, Ak, Rui, Erukam, Akra.*

Parts used : Juice of *leaves* and *stalk* or the powdered *root-bark* of *Calotropis gigantea* or *procera*, **N. O.**, *Asclepiadæ.*

F. Dose : Of root-bark—over 1 dram. [*Medicinal Dose* : Root Bark, 3—10 gr. (alterative), 30—60 gr. (emetic)].

Criminal uses : (1) As *Abortifacient* (by external application or ingestion). (2) For *Infanticide* (internally). (3) *Cattle poison*. (4) *Homicide* or *Suicide*.

Symptoms : (1) Gastro-intestinal irritation—with salivation and local blisters on mouth and lips (2) *Convulsions*.

Treatment : (1) *Evacuate* by mustard (2) *Demulcents*—Castor oil, hot stupes to abdomen. (3) *Stimulants* and warmth.

CANTHARIDES.

Spanish Fly, Blistering Beetle, *Lytta*. (Dried body of *Cantharis Vesicatoria*).

Forms & Fatal dose :—(1) *Liquor Lyttæ*. Blistering fluid—1 dr. (2) *Powdered fly*—1 to 2 dr. (3) *Tincture*—1 oz. (Tinctures vary in strength, but usually 1 oz = 6 gr. powdered fly). **Fatal period :** 24 hours or more.

Symptoms :

1. *Mouth & Throat*—blistered, ∴, smarting ; thirst, pain in swallowing. ; *Salivary glands*—are swollen : *Salivation*.

2. *Stomach* :—blistered, ∴ burning sensation ; *vomit*—bloody and accompanied by shiny particles of fly. *Gripes* and *tenesmus*—are present.

3. *Nephritis*. ∴, dull heavy pain in loins ; *urine*—is suppressed or passed with strangury or hæmaturia ; *priapism*, swollen and inflamed genitals.

4. *Peritonitis*—within 24 hours ; collapse, coma, convulsions.

Treatment : Avoid oils and fats.

1. *Evacuate, if not yet blistered*, by stomach tube,—repeatedly or by apomorphine + strychnine or mustard.

2. *Ease pain* by morphia as suppository or per urethram, ; by chloroform inhalation ; by *demulcents* (emulsion, gruel etc.) *To keep alive*, stimulate.

3. *To get urine*, cup over loins, give hot hip sitz baths.

4. *When acute symptoms subside*, foment abdomen or leech epigastrium.

Medico-legal points :—

1. The toxicity of a preparation of cantharides depends on the quantity of **cantharidin** present in it.
2. **Cantharidin** is found in hair medicines and oils and also in *mylabris cichorii*, (*telini fly*), *m. pustulata*, *m. punctum*.
3. Under § 328 I. P. C., it is not criminal to **administer cantharides medicinally** to any person with the intention of exciting sexual passions. But nothing short of toxic dose, acts as aphrodisiac.
4. **Accidentally**, *powdered cantharides* has been used in mistake for jalap and pepper and the ointment for sulphur ointment; death has followed its use as an aphrodisiac or abortifacient. It resists putrefaction and can be discovered in the folds of stomach mucosa, years after burial.
5. Long-continued small doses cause organic changes almost **similar** to those that occur in **phosphorus poisoning**.

ANIMAL FOOD POISONING.

Nomenclature :—*Food poisoning* = bromo-toxismus; *animal food poisoning* = zootropho-toxismus; poisoning by *meat* = kreo-toxismus; by *sausage*, allantiasis or botulism; by *milk*, galacto-toxismus; by *mussel*, mytilo-toxismus; by *fish*, ichthyo-toxismus; by the tetrodon fish, *fuguismus*; by products normally present in the animal eaten, *signatera*. [*Vegetable grains*, sito-toxismus; by *vetch*, = lathyrism or lupinosis; by *maize* or pellagra, maidismus; by *grain*, ergotism].

Source* = from eating these kinds of foodstuffs :—

1. **Food normally containing poisonous products**—*e. g.*,

* Poisoning by food is due either (1) to *bacterial* growth or (2) to *chemical* poison or (3) to both. *Ptomaines*, which are not specific toxins, rarely cause poisoning, except when mussels or corned-beef are eaten. What has often been called ptomaine-poisoning is the result of a mixture of substances, in which ptomaines may not exist!

certain molluscs and crustaceae found in shallow water, fungi, mackerel, herrings, the sardine, *clupea longiceps* &c., the sturgeon of Russia, the barb of Europe, the tetrodon of Japan, fish living among coral reef, and some fish during their breeding season only.

2. Wholesome food, disagreeing with its host on account of :

(a) (i) **Age** :—Fish in spawn is unsuitable as an article of food ; babes suffer, if stuffed with meat, eggs, tinned milk, cheese etc. ; (ii) **Want of Exercise** :—rich food ill suits idle people ; (iii) **Illness**—requires diet to be bland ; (iv) **Mode of eating**—as, when even good food is hastily eaten after a prolonged fast ; (b) **Idiosyncrasy** of eater : towards, say, crabs, certain shell-fish (mussels, specially, if they are thin), linseed, strawberries etc. (Allegations of idiosyncrasy should be supported by feeding-experiments on animals and, if possible, on men.)

3. Food containing poisons, owing to—

(a) **THE ANIMAL HAVING FED ON PLANTS OR GRAINS POISONOUS TO MAN**,—*e.g.*, milch cows eating belladonna leaves, fowls or birds eating arsenuretted or copper-steeped grains, etc., honey gathered from poisonous plants.

(b) **METALLIC CONTAMINATION** ; *e.g.*, Pork salted in leaden vessels, vegetables coloured green by copper, ice cream prepared in metallic vessels, food cooked in badly-tin-lined vessels—imbibe those metals respectively.

4. Food having in it the germs of specific disease : *e.g.*, typhoid or cholera germs in oysters, milk, water ; scarlet fever and diphtheria germs in milk ; pellagra poison in diseased maize ; poison in *lathyrus sativa*.

5. Food having in it pathogenic bacteria : 'Good meat kept for some time, grows *b. enteritidis* (Gartner), *b. par*

typhosus B., which give rise to ptomaines. Besides meat that is septic or contaminated with sewage, ordinarily, pork, veal, beef and horseflesh are frequently contaminated with b. enteritidis, b. typhosus.

6. Food having in it simple products of decomposition.

7. Food containing gross parasitic worms, e. g., trichina spiralis, cysticerci, taenia solium, etc.

II. From auto-intoxication by ptomaines which develop during an attack of peritonitis.

Onset : Almost immediate,—if the poisoning is by a preformed *chemical* (toxalbumose or ptomaine) ; **Delayed** (12 to 60 hours, more or less) if it is a *bacterial* poison.

Symptoms : They usually assume one particular type, but may be a mixture of one or more types, as follows :—

1. **Gastro-intestinal** (chiefly seen in poisoning by non-putrefactive, bacterially-contaminated meat) : Vomiting, purging, gripes, exhaustion, cramps in legs, restlessness, *collapse*, suppression of urine—more or less violent according to dose. Or, patient sinks into *typhoid state* ; others get *febrile reaction*.

2. **Cardio-Respiratory Paralysis** (chiefly seen in botulismus) : Dryness and redness of mouth and of throat, dilatation of pupils, deafness, faintness, dizziness, quick pulse, respiratory difficulty, asphyxia.

3. **Neurotic** (chiefly seen in fish, mussel, and sausage poisoning) : Ptosis, diplopia, paralysis of accommodation, dilatation of pupils, bulbar paralysis, numbness in the extremities ; muscular twitchings or convulsions ; delirium, coma.

4. **Angio-neurotic** (chiefly seen in fish poisoning) : Swelling and inflammation of eyelids and face, watering of the eyes, rash, urticaria or other skin troubles.

Treatment :

1. *Evacuate poison by emetics* (mustard) or stomach tube ; also *purge* by calomel or castor oil.

2. *Neutralize by biniodide of mercury.* (Liqr. hyd. perchlor. m 30 + pot. iod. gr. x + ammon. carb. gr. v + decoc. cinchonæ ad 1 oz). Use Salol, β -naphthol, sulphocarbolates.

3. *Treat Symptomatically* (on general principles)—collapse, convulsions, paralyses, coma &c. [Amyl nitrite, strychnine, digitalis, caffeine, sal volatile, *tannic acid*, atropine etc. are recommended.] In fish poisoning use—Pot. chloratis, liqr. ammon. acet., tr. capsici, spt. chloroformi.

Prognosis is favourable if—(a) patient *rallies* from the primary shock, (b) *survives* 7—8 hours (or 24 hours, in cases of the weak and children) and if (c) *vomiting* and *purging* are free.

P. M. appearances : [*Nothing characteristic.*] Body putrefies rapidly. Hæmorrhagic or congestive lesions in *alimentary tract, kidneys* and *lungs*.

Diagnosis of real meat poisoning rests on : (a) a positive re-action of the patient's serum for Gaertner's bacillus or B. *suipestifer*, or (b) on isolation of these from patient's stool or food. (2) **From cholera** :—by (a) rise of temperature, (b) formation of abscesses on skin. (c) absence of anuria. (3) **From Typhoid**—by Widal's re-action.

Chemical Notes :

1. **Ptomaines** (or *cadaveric alkaloids*) are crystalline compounds of varying physiological action, generated, as result of bacterial activity on *dead* organic matter. These 'alkaloids' give place to 'amins' as putrefaction progresses. They answer to nearly, but not really, all the ordinary RE-ACTIONS of the vegetable alkaloids, and their presence in some cases prevents the detection of certain vegetable alkaloids by the usual

reagents. The free ptomaines are more energetic than their *salts*. Some ptomaines are harmless, others are toxic.

2. The **Poisonous ptomaines** are : cadaverin, cholin, gadinin (cod fish), muscarin (agaricus muscarius or fish), mytilotoxin (mussels), neurin (meat), putrescin (foeces and urine), tetanin, typho-toxin, tyro-toxicon (cheese). [These or some of these are *likely to be confounded with*—conine, nicotine, strychnine, morphine, atropine, digitaline, veratrine, delphinine, colchicine] The **non-poisonous ptomaines** are : methyl-amin, di-methyl-amin, tri-ethyl-amin, ethyl-amin, di-ethyl-amin, propyl-amin, neurodin, mydin, pyocyanin, betain.

3. **Preserving** in ice, or by smoking, salting or thorough cooking cannot render innocuous a food, in which ptomaines or spores of micro organisms are present. Such food need not necessarily (and they do not as a matter of course) develop any suspicious *odours*. The centre of a joint and of a sausage is impossible of sterilization even by the most thorough cooking.

[**Leucomaines** are alkaloidal or basic substances elaborated by microbes in the body *during life*.]

4. **Preservatives and colouring matters in food stuffs** :—*Egg yellow, Tartrazine, Annatto substitutes* (all anillin dyes) are harmless in the amount used. *Boric acid, borates, or Salt* are added to margarine and butter (30 gr. to 1 lb), hams and bacon (4—8 gr. per 1 lb), pastry, pork, sausages. (2) H_2SO_3 , *Salicylic acid* and *salicylates* are added to "British" wines and "Temperance" drinks (7 to 150 gr. per gallon.) (3) *Formalin, Benzoic acid, Mystin* (sod. nitris+formaldehyde), *Accoine* (sod. benzoas+sod. carb.) to milk and milk preparations. (4) *Cupri sulph* is used to colour bottled or tinned preserved peas, beans etc. (5) *Smoke* (=borax+salt+red coal—tar dye+creasote) is brushed over tinned meat and fish to simulate real smoking. (6) *Sodium fluoride* to milk, butter and margarine. (7) *Salicylic acid, Formaline* Na or Ca *bisulphite* or *saccharine* to syrups.

VEGETABLE FOOD POISONING.

1. ERGOT, Spurred Rye

It is—the sclerotium of *claviceps purpurea*, a fungus liable to grow inside the paleæ of plants of N. O. graminacæ. The *leera* of barley and oats and *kindol* of *bajri* resemble the ergot of rye.]

[A fungus, the lowest of vegetable organisms, has 3 stages in its life: (a) *Mycelium* or vegetating stage of growth and increase; (b) *Thallus* (=mushroom) or reproductive stage; (c) *Sclerotium*, an inconstant intermediate stage. Ergotization of rye is more prevalent during wet seasons and in ill-drained places].

Fatal dose—unknown.

Symptoms:

A. Acute cases (practically unknown):—

1. GASTRO-INTESTINAL irritation: salivation, choleraic diarrhoea, urgent thirst.

2. ACTION ON MUSCLES: (a) *Pulse* is rapid, jerky, irregular, small. (b) *Peripheral vessels* are constricted; hence,—*chilliness* all over body (specially in women). (c) *Fatal abortion* in women.

3. *Coma*, pain in head, violent burning pain in limbs and chest. *Pupils* are dilated. *Respiration*—is rapid.

B. Chronic cases, ("Ergotism"):—two varieties:

1. GANGRENOUS* (also called ignis sacer or ignis sancti Antonii): attributed to *Sphacelinic acid*,—commences with formications of feet, backache, muscular contractions, nausea, abortion, amenorrhoea, agalactea, and ends with dry or moist gangrene of peripheral parts, specially, fingers, toes, ear and nose.

2. NERVOUS—attributed to *Cornutin*.—Headache, weakness, spasms of flexors of extremities and extension of toes, with severe general tetanic paroxysms, formications, numbness,

maesthesia of extremities and of body generally, amaurosis, giddiness, melancholia, dementia.

Treatment : [*Always keep patient recumbent.*]

1. *Evacuate, by emetics* (mustard) or stomach tube
2. *Destroy it in situ by*—tannic or gallic acid ($\frac{1}{2}$ dr.)
3. *Neutralize by diffusible stimulants* (ether, brandy &c), sparteine, amyl nitrite inhalation and nitroglycerine gr. $\frac{1}{10}$ per mouth. Secure warmth.
4. *Prevent abortion*—by giving opiates freely.

P. M. Appearances (Acute cases) :—*Jaundice* and *petechiae*. Extravasations of blood into viscera. Anaemia and fatty degeneration of *Liver* and *Kidneys*.

Medico-legal Points :

1. **Its toxicity.**—Its danger lies in its administration as an abortifacient. Long continued administration is more dangerous to life than single large doses.
2. **Ecbolic action**—It acts on contracting but not much or at all on quiescent pregnant uterus.
3. **Ergotine** is not an alkaloid but a watery extract.

II. LATHYRISM or LUPINOSIS.

Due to eating continuously, lathyrus sativa or cicera (N. O. Leguminosæ), *Khesari dal*, *Teora*, *Masang*. [Perhaps the smaller-seeded variety, *lakhory*, is harmless]. Boiling somewhat destroys its action, as also mixture with other articles of food.

Symptoms (found chiefly in *males*) are: Sudden spastic *paraplegia* and *trembling* with or without sudden *pain in the loins*. The leg—*muscles waste*; they are at first hyperæsthetic, then lose *sensibility*. Muscles of face and neck are unaffected but *back-muscles* become rigid. *Reflexes* and *Sphincters* are unaffected—knee jerk obtainable, ankle clonus cannot be

elicited owing to rigidity of tendo Achilles. [It resembles the convulsive form of Ergotism.]

III. PELLAGRA or ZEISM.

Cause :—An *endemic*, non-contagious disease, affecting annually (from spring to autumn) those who live upon *fermented, unripe, maize* (*Zea mays*).

Symptoms :—Onset with indefinite pains in chest, *erythematous* skin-eruptions and soreness of bones. Then come on *gastro-intestinal irritation*, with raw tongue, mild diarrhœa, frightfully *rapid emaciation*, symmetrical “burnt”—like spots on outer aspects of upper limb, ending in *paraplegia* and *dementia*. At this stage, recovery is impossible.

IV. DARNEL POISONING.

Cause :—from eating *lolium temulentum*,—darnel, *Mostaki, Mochui*. **Symptoms** : Irritant symptoms, giddiness, tremors and twitching of muscles, stupor, dilated pupils.

V. KODRA POISONING.

Cause :—eating *paspalum scrobiculatum*,—*Kodra, Harik* (varieties—*gora* and *majara*). **Symptoms**—like Darnel poisoning.

VI. BERI BERI.

Due to eating over-milled (or polished) rice. **Symptoms**—peripheral neuritis, dry and wet *varieties*. See any Text Book on Medicine.

VII. POISONOUS FUNGI, MUSHROOMS.

Forms :—(1) *Amanita Muscaria*, Fly-blown agaric. Its alkaloid—*Muscarine* (2) *Morelle* (3) *Agaricus albus*, *Ghare-Kum, Jangli bulgar, Kiain, Chhatrak, Banger-chhata, Moksha*, (4) *A. Procerus* (5) *A. Dryophilus* (6) *Boletus atrofulvus*.

Similar Actions of—*Tylophora faciculata, phooi-dori, Daphne, Mezereum*.

Chemical Notes. Edible and Poisonous are the two varieties of fungi. **EDIBLE FUNGI** should be eaten *fresh*, because, they are rich in water and albumin and undergo incipient decomposition readily, a harmless fungus being thereby rendered poisonous. Similarly, they should be eaten as soon as cooked and never set aside after cooking, to be warmed up and eaten afterwards. The alkaloid **AMANITIN** is present in all fungi; toxalbumin **PHALLIN** is obtained from agaricus phalloides. Amanitin is apt by decay to be converted into lecithin and neurin. The urine **ELIMINATES** the poison and is intoxicating, if drunk.

Identification :

EDIBLE FUNGI.

Grow solitary, in dry, airy places.

Spores—plain and round.

Colour—white or brownish

Flesh—compact, brittle

Juice—watery

Do not change colour by action of air when cut

Odour—agreeable

Taste—not bitter, acrid, saltish or astringent

POISONOUS FUNGI.

Grow in clusters in woods and dark, damp places

Spores—irregular or round, pink, rusty-brown or white

Coloured—bright

Flesh—soft, tough, watery

Juice—milky

Become brown, green or blue when cut and exposed

Odour—very disagreeable

Taste—is bitter, acrid, saltish or astringent

Symptoms : **NEUROTIC, IF ONSET IS IMMEDIATE :** *Excitation* of spirits, and sudden onset of *laughing mania*; *illusions* of sense, *giddiness* and *diplopia*, dimness of sight, *pupils* contracted or dilated; sweating and skin *eruptions*; *insensibility*, *convulsions*, stertorous breathing.

IRRITANT, IF ONSET IS DELAYED (8 to 10 hours) : Nausea, vomiting, purging (bloody), colic, spasms and *jaundice*; bile, blood or albumen in *urine*, which may also be suppressed.

Treatment. [*Maintain recumbent posture.*]

1. *Evacuate*—by emetics or tube; and by purgative.

2. *Neutralize* physiologically—by **Atropine** gr. $\frac{1}{10}$ (or tr. belladonna, m xx) and **morphine** gr. $\frac{1}{8}$ hypodermically.

3. *Treat Symptomatically* : Strychnine, coffee, abdominal poulticing etc.

Identification—Examine stomach contents microscopically for the spores.

OTHER IRRITANT POISONS.

[*Gastro-intestinal irritation present in all.*]

<i>Name and Fatal Dose.</i>	<i>Other Symptoms.</i>	<i>Antidotes.</i>
Barium Carb. or Chloride (F. D. 1 dr.)	Giddiness, cramps, convulsions, diplopia, dyspnoea, irregular, weak heart, paralysis.	Soluble sulphates ($\frac{1}{2}$ oz.) or Alum (1 dr.) Morphia hypod.
Bichrom. of K., Chromic Acid, (2 dr.)	<i>Acute</i> : cramps, coma, dyspnoea. <i>Chronic</i> : nasal catarrh, ulceration and septum destruction. Skin ulcers.	Mag. Oxid. or Carb. Chalk.
Gold Chloride.	Convulsion, salivation.	Nothing special.
Iron Sulph. (F.D. over 1 oz.) Chlor. (over 1 $\frac{1}{2}$ oz.)	—	Do
Tin Chloride (in strong acid solution.)	—	Albumen, opium, Ammon carb.

The following irritants are to be treated on general lines (*viz.* evacuation of contents of stomach, use of demulcents and treatment of symptoms.) [The doses given are *medicinal*.]

Actæa Racemosa.	Olive (wild).
Aloes (F. Dose 2 dr.)	Osmium.
Apomorphine	Palladium.
Anemone Pulsatilla.	Platinum.
Cadmium.	Pot. Chlorate.
Caffeine.	Rhodium.
Capsicum.	Scammony (convolvulaceæ)
Cayenne pepper.	Scilla (24 gr.)
Cobalt.	Scoparium Cytisus.
Colocynth.	Solanine.
Cuscuta reflexa.	Strontium.
Delphinium	Thallium.
staphysagrie.	Tylophora fasciculata
Elaterin (<i>Katrindrayam</i>).	(<i>Bhoos-dori</i> .)
Emetine.	Tylophora Asthmatica
Iridium.	(<i>Antamul, jangli-pikvan</i>
Gloriosa Superba.	<i>Nay-palai</i>).
<i>Kokai</i> .	Tin.
Laburnum.	Uranium.
Nickel.	

Ipomoea HEDERACEA VEL. CAERULEA (*Kaladana, Mirchai, Kala-zirki, Kolly-vittulu, Kody-Kakkatanvirai*), seeds (30-50 gr) are cathartics. I. PURGA = Jalapa of B. P. (10-30 gr of root). I. TURPETHUM (*Teori, Nisoth, Bhutkari, Shivadai, Tegada*) Root bark ($\frac{1}{2}$ -1 $\frac{1}{2}$ dr) is cathartic.

Yew (*Taxus baccata, Abies webbiana*). *Talisapatra, birmi* (N. O., Coniferae):—Death occurs from accidental eating by children of *berries* or overdose of *leaf-decoction* (for worms or procuring abortion). It is a Gastro-intestinal irritant.

Edible fruits like gourd, water melon, cucumber, pulbul (*trichosanthes dioica*), Karela (*momordica charantia*) when grown *wild* and *bitter* are gastro-intestinal irritants.

NARCOTICS.

OPIUM. *Afium, Afim, Ahijen.*

It is—the inspissated juice, obtained by incising the unripe capsules of *papaver somniferum*, N. O., papaveraceae,

Similar actions of Morphine, Narcotine, Narceine*

Toxicology : Morphine is the chief constituent ; its content determines the poisonous quality of a sample. Morphine is about four times as strong as opium, although good opium contains $\frac{1}{15}$ th of its weight of morphine.

[The Percentage of morphine in—(a) *Ordinary Bazar opium* is—4 to 5%/. (b) *Best Indian opium*—10%/. (c) *Best Turkey opium*—20%. *Poppy oil* is non-poisonous.

Physical characters.—Opium is a brownish-black, resinous matter, with offensive odour and bitter taste.

Fatal doses of :—(1) *Pure opium or extract opii*, gr. 4—5. (2) *Crude opium*—gr. 8. (3) *Tr. opii*—2 to 8 drams. (4) *Morphine*—gr. 2. (5) *Codeine*—gr. 4.

Fatal period : 6—12 hours ; average,* 10 hours.

Prognosis : Favourable after—lapse of 24 hours, early vomiting, copious sweating. Unfavourable : Pupils very strongly contracted ; pulse and respiration are increasingly slow ; increase of cyanosis ; salivation ; tremulousness or twitching of groups of muscles.

Preparations of opium :—*Opium*, $\frac{1}{2}$ to 2 gr. ; *Pulv. Opii* (same dose), *Extract. opii* (=20% morphine), $\frac{1}{4}$ to 1 gr. ; *Ext. opii liq.* (75% morphine), 5 to 30 m ; *Pil. ipecac. c. scilla* (1 : 20), 4 to 8 gr. *Pil. plumbi c. opio.* (1 : 8), 2 to 4 gr. ; *Pil. Saponis co.* (1 in 5), 2 to

*Codeine, Thebaine and pure narcotine, the other alkaloids of opium, are convulsants. The predominance of one or other of these alkaloids in the different samples of opium (as well as individual idiosyncrasy) is responsible for the anomalous symptoms hereafter detailed.

4 gr. ; *Pulv. cretæ aromat. c. opio* (1 : 40), 10 to 40 gr. and $\frac{1}{2}$ to 1 gr. for a child 1 year old ; *Pulv. Ipecac. co.* (Dover's—1 : 10), 5 to 15 gr. ; *Pulv. Kino Co.* (1 : 20), 5 to 20 gr. ; *Pulv. opii. Co.* (1:10), 2 to 10 gr. ; *Tr. Camphor. co.* (Paregoric or paregoric elixir— $\frac{1}{4}$ gr. opium in 1 dr), $\frac{1}{2}$ to 1 dr., for a child 1 year old, 4 m ; *Tr. opii* (Laudanum—75% morphine), 5 to 15 m or 20 to 30 m, if single ; *Tr. opii ammon.* (Scotch paregoric— $\frac{3}{8}$ gr. opium in 1 dr.) $\frac{1}{2}$ to 1 dr. ; *Empl. opii* (1 : 10) ; *Lint. opii* (1 : 2) ; *Supp. plumbi co.* (1 gr. opium in each) ; *Ungt. gallæ c. opio* (7½ % opium) ; *Morphinæ acet.*, *hydrochlor.*, or *tartras*, $\frac{1}{8}$ to $\frac{1}{2}$ gr. *Liq. morphinæ acet.*, *hydrochlor.* or *tart.* (1 %) 10 to 60 m ; *Supposit. morph.* gr. $\frac{1}{4}$ in each ; *Troch. morph.* gr. $\frac{1}{36}$ in each ; *Troch. morph. et ipecac.*, gr. $\frac{1}{36}$; *Tr. chlorof. et morph. co.* (1 : 13), 5 to 15 m ; *Inj. morph. hypod.* (5 gr. in 110 m) 2 to 5 m. hypodermically. Codeine gr. $\frac{1}{4}$ to 2 ; Codeinæ phosph. gr. $\frac{1}{4}$ to 2 ; *Syr. codeine* (1 : 240), $\frac{1}{2}$ to 2 dr. *Cotarnine hydrochlor* or *Stypticine*, $\frac{1}{4}$ to $\frac{1}{2}$ gr. *Heroin* $\frac{1}{12}$ to $\frac{1}{6}$ gr. ; *Peronin* gr. $\frac{1}{8}$ to $\frac{1}{2}$; *Dionin* gr. $\frac{1}{2}$ to 2 ; *Glycaphorm.* 1 to 2 dr. *Chlorodyne* (7 gr. morphine in 1 oz.) 5 to 15 m.

Proprietary preparations containing opium : (1) *Winslow's "Soothing Syrup"*, "Quietness" (1 gr. morphine in 1 oz). (2) *Godfrey's "cordial"* ($\frac{1}{2}$ gr opium in 1 oz), (3) *Dalby's "carminative"* ($\frac{1}{6}$ gr opium in 1 oz) ; (4) *Locock's Pulmonic wafers*, (5) *Black drop* (3% morphine) (6) *Battley's "Sedative solution"* (2½ % morphine) (7) *Nepenthe* or *anodyne tinct.* (.75 % morphine) (8) *Mother's Friend* or *Baby's Teething powder* (9) *Kay's Linseed co.* (10) *Keating's cough lozenges* (11) *Beecham's cough pills* (12) *Brompton consumption specific.* (12) *Chlorodyne.*

One grain of opium is contained in—Extract opii $\frac{1}{2}$ to 1 gr. ; Ext. opii liq., & Tinct. opii 14 $\frac{1}{2}$ m. ; Tr. opii ammoniat. 96 m. ; Vin. opii, & Tr. camph. co. $\frac{1}{2}$ oz. ; Pil. Saponis co. 5 gr., Pil. Plumbi c. opio, 8 gr. ; Empl. opii, Pulv. Ipecac. co., Pulv. opii co., 10 gr. ; Pulv. Kino co. 20 gr., Pulv. cretæ arom c. opio., 40 gr., Ungt. gallæ c. opio 13½ gr., Suppositoria plumbi co. 15 gr., Lint. opii 29 m., Enema opii 1 oz.

Symptoms* (Usual) : Onset—within $\frac{1}{2}$ to 1 hour of eating solid opium, or within 15 minutes, if *Morphine*.

1st Stage=increased brain circulation. A passing period of exhilaration of spirits, with accelerated cerebral, cardiac and respiratory actions.

2nd Stage=increasing brain congestion. Increasing thirst, headache, vertigo. Face—suffused. Pupils—contracted. Consciousness—giving way. Sensibility,—diminished. Pulse—full, slow, strong. Respiration—slow, deep, perhaps stertorous. Skin—dry and warm.

3rd Stage=prostration : Countenance—pallid. Lips—cyanosed. Froth at nostrils. Eyes—Injected. Pupils—pin-point and do not react to light ; they dilate when coma is deep. Respiration—slow, stertorous, imperfect, gasping. Pulse—small, irregular, frequent. All the bodily secretions are looked up. Skin—cold, clammy. Reflexes are abolished Sphincters relax towards the end.

[During convalescence, slight albuminuria, numbness and tingling of fingers, and obstinate tenesmus may be noticed.]

Anomalous Symptoms.

Neurotic : (a) *Strabismus*, tetanic convulsions of face-muscles or of whole body, and lockjaw—specially, if victim is an infant or if large dose of *morphine* has been taken.

(b) *Delirium*, clonic spasm, spastic gait, heightened reflexes (priapism, etc.), *paralyses*, *anæsthesiæ*—in adults.

Pupils : Dilated or unequal—especially before death.

Secretory : Salivation. Diuresis. Vomiting and purging. [They cure, if they set in before coma.]

Remittent type.—(a) Patient may apparently be getting well, when, suddenly he may again become worse and die, perhaps from

* Poisoning by *Morphine* salts is characterized by rapid onset and often, convulsions. *Chlorodyne* contains—*Morphine*, *HCN*, *cannabis indica* etc. ; hence, pupils may be dilated.

reabsorption of opium excreted into the stomach or bladder or from acute respiratory failure. (b) Similarly, symptoms may be long postponed.

Cutaneous : *Itching* and dryness of skin, erythema, urticaria, wheals, roseola, vesicles or *desquamations*.

Treatment. [Do not give wine or brandy.]

1. *Evacuate (a) contents of stomach*,—by zinc sulphate ($\frac{1}{2}$ dram) in warm water or apomorphine hypodermically or, by tube. *Repeat stomach-washing now and again, as morphine is excreted into stomach, after absorption into blood*. (b) *Evacuate Urine*—by catheter, and (c) *Bowels*—by purgation.

2. *Neutralize it in situ*, by pot. permanganate solution (10—15 grs. to $\frac{1}{2}$ or $\frac{1}{4}$ pint.) till the washings of stomach return unbleached. [*Pot. permanganate 1 gr. neutralizes 1 gr. of a morphine salt or 10 gr. opium*].

3. *Physiologically antagonize the respiratory failure*, by cocaine or atropine (gr. $\frac{1}{80}$ —till $\frac{1}{4}$ gr. is injected), or tr. belladonna m 30, hypodermically, till pupils get dilated. [*Atropine gr. $\frac{1}{80}$ antagonizes 1 gr. morphine. While morphine is useful in cases of atropine poisoning, atropine is not of much use in morphine poisoning. When atropine is given in morphine poisoning, the state of respiration (its quickness) and of pupils (dilatation) should be our guide as to whether atropine has been doing good or not*].

Stimulate Respiration by artificial respiration, faradisation of the phrenics in the neck and of the arch of diaphragm, and by oxygen or ammonia inhalation (but not the vapour of ammonia water) and by keeping patient awake (because, with deepening coma, breathing fails) but never march him about when the poisoning is too far gone, the body being cold and patient comatose.

4. *Stimulate heart* by coffee decoction given by mouth or as enema or by strychnine, atropine, digitalin, ether, caffeine &c. hypodermically, or by normal saline injection.

5. *Remove cerebral congestion by venesection* (upto 10 oz), by ice to nape of neck, or cold affusion to head and spine, or warmth or blister to calves and soles of feet. [*Venesection is of momentary value and dangerously depresses heart and respiration and stimulates rapid absorption of opium from the stomach.*]

Diagnosis (See p. 168) From (1) **Acute Alcoholism**—by absence of alcoholic *odour* and presence of morphine in urine, by contracted *pupils*, and by inability to *rouse* by external stimuli. (2) Increased intracranial pressure (**apoplexy**)—by *age* (not invariably old), *nutrition* of body (not necessarily stout and plethoric), by absence of *atheromatous* state of arteries, of unilateral *convulsion* or *paralysis* or *retinal* changes and of *rousability* and by presence of unequal *pupils*, history of abrupt *onset*, *odour* of opium in breath. (3) **Uraemia**—by absence of *albumen* in urine, of hypertrophy of left *ventricle*, of *arteriosclerosis*, of *retinal* changes, of *convulsions*. (4) **Diabetic coma**—by absence of *sugar*, and *diacetic acid* in urine. (5) **Epileptic coma**—by contraction of *pupils* and absence of *Babinsky's* sign. (6) **Chloroform, Ether, Carbolic Acid, Chloral** poisoning—by presence of characteristic *smell* of each. (7) **Acute Hydrocephalus** (of child)—by want of retracted *abdomen* and presence of equally contracted *pupils*.

P. M. Appearances : [Those of asphyxial death], *Trachea* and *bronchi* contain pink frothy fluid. *Lungs* *Brain*, *Stomach* (*mucous membrane*), *Liver* and *Spleen* are all congested.

Medico-legal points.

1. **Suicide** by opium is the commonest in India, owing to its being readily available and causing sleep merging into painless death. **Accidental poisoning** of **CHILDREN** may occur from eating opium pills carelessly left about by their old relations,

or (b) from taking children's "soothing syrups" or "baby comforters" or decoctions of leaves, seeds, seed-capsules of the poppy as well as the raw blossoms and fruit of "red" poppy ; or (c) from an overdose of opium given medicinally or habitually, to keep them quiet. **Accidental** poisoning of ADULTS occurs from taking (a) liniments by mistake or (b) over-dose of patent-medicines for cough, phthisis or diarrhoea, or (c) from absorption of external applications, injections, enemata or suppositories of morphine. **Homicidally**, opiates may be given, disguised in wines, in order to facilitate other crimes (rape, robbery &c), or to kill.

2. **Opium habits.**—ADULTS in this country habitually *eat* opium or morphine in very large doses as a prophylactic or cure for malaria, dysentery, syphilitic rheumatism, metrorrhagia, elephantiasis. [In their case, it is not possible to guess the fatal dose.] They also *smoke* it for pleasure as 'Chundoo',—a more harmful practice. CHILDREN in United Provinces, Assam and Central India are habitually given opium by their *poor mothers*, to enable the latter to do their work uninterrupted. *Nurses* often give opium to their charge to keep them quiet. [*Habitual* use of opium does not shorten life nor injure health, though it causes periodical attacks of purging.]

3. **Toleration & Idiosyncrasy.**—CHILDREN (*under 5 years*) bear opium very badly : (a) Dover's Powder—1 gr. has killed a child 4 months old ; (b) Tr. Opii—1 m. has killed child 7 days old, and 4 m, 9 months old. (c) Opium—1/15 gr. has killed a child 7 days old. In ADULTS, on the contrary, (a) the presence of—pain, tetanus, fevers, diabetes, acids in blood (rheumatism, gout etc.), mental alienation (*e.g.*, puerperal mania), delirium tremens, hydrophobia, cancer, peritoneal diseases, strychnine and atropine poisoning,—*increase tolerance* for it. (b) Fatty heart, severe pulmonary complication (pneumonia, asthma, bronchitis etc.) and bad

state of kidneys *decrease tolerance*. Death of adults from *hypodermic injection* of morphine (even $1/6$ gr.) is on record.

4. **Absorption & Elimination.** Opium may lie long in the stomach without being **ABSORBED**. And bits of opium may be caught between the folds of the rugæ and retained there for slow absorption, although the rest of the stomach may have been thoroughly washed. By whichever channel absorbed, like arsenic, it is **EXCRETED** *into the stomach* and with urine; hence, wash stomach out and relieve bladder *again and again* [Though usually during its elimination it may be found in urine, 3 days after ingestion (and after 7 days in habitual eaters), yet, if a fluid preparation of it were drunk, even the most diligent search may fail to reveal trace of it in the viscera. Opium checks all *secretions* except that of skin which actively secretes.]

5. By keeping long, morphine (specially in solution) may change into **apomorphine**. Apomorphine turns green when exposed, but, all the same, retains its activity. It is much less certain in its action, when given by mouth and acts within 3 or 4 minutes when given hypodermically. It may be injected even in opium poisoning. It may be given for weeks without any serious result, and, in cases of depression following its use, a dose of brandy is quite enough. **Apocodeine** is less reliable than apomorphine, which latter may be obtained from morphine as well as codeine.

6. **Impurities of 'crude' opium:** dust, sands, charcoal treacle, poppy seeds and capsules, juice of madder (ákanda) gánjá, tobacco, resin, bael or tamarind pulp, leaves and twig of acacia arabica (báblá), cowdung etc.

Separation:—Divide suspected article into small fragment (if solid), or, reduce it to syrupy consistence by evaporation (if liquid); filter and digest with alcohol + acetic acid; + Pb-acetate = "ppt." of meconate of lead, the 'filtrate' containing morphin

acetate. (a) This ppt. + H_2S solution = Pb_2S pptd ; and *meconic acid* is crystallized out from the solution. (b) The "liquid" containing morphine acetate + H_2S = Pb -sulphide is pptd. and *morphine* remains in the solution. This solution + K_2CO_3 and evaporate to dryness = morphine crystals.

Tests for Morphine : (a) + HNO_3 = deep orange-red solution. This solution + heat + warm water + sodium thiosulphate = colour turns yellow but not violet (*vs.* Brucine). (2) + Molybdic acid + strong H_2SO_4 = change of colours from intense reddish purple to dingy green to sapphire blue. (*vs.* Strychnine, Brucine, Veratrine, Chloral). (3) + Tr. ferri perchlor = blue colour. (4) + Phosphomolybdic acid = yellowish ppt., sol. in excess of NH_4OH to deep blue sol. (*vs.* Brucine, Cocaine, Strychnine).

Tests for Meconic Acid : + Ferric chloride = deep blood-red colour.

SULPHURETTED HYDROGEN, H_2S .

Similar actions of : (1) Carbon disulphide (2) Pit, Sewer or Cesspool gas = H_2S + $(NH_4)_2S$ + CO . (3) Laughing gas, N_2O .

Toxicology : 1. It is absorbed by lungs as well as by Skin. Fatalities* have followed upon entrance of sewer gas into bed-rooms.

2. It is evolved by (a) agitating sewerage, (b) mixing sewerage with acids or (c) using CS_2 as solvent of fats, oils, guttapercha, india rubber, phosphorus.

I. Acute Poisoning. [Accidental always].

Symptoms :

(a) IN BIG DOSE (over 3—8%) = *Narcotic*.—Immediate *asphyxia* with tetanic convulsions, profound *insensibility*. *Pupils*—dilated, *eyes* being directed towards one side. *Pulse*—irregular, *Respiration*—stertorous, *Skin*—cold.

(b) IN SMALL DOSE (less than 3%) = *Narcotico-irritant*. Headache, dizziness, prostration, delirium, coma. Heaviness at

pit of stomach, vomiting, diarrhoea, abdominal pain. Irritation of eyes and of respiratory mucous membrane : *Dyspnœa* (lips livid, sense of oppression about chest) followed by *febrile* reaction. *Pulse*—irregular. *Temperature*—subnormal.

Treatment :

1. *Remove asphyxia*—by supplying pure air, oxygen, chlorine or ammonia ; by galvanism, by artificial respiration, respiratory and cardiac tonics, alternate hot and cold affusion to chest and head or by venesection, if necessary.

2. *Stimulate* by warmth, friction, rectal saline injection.

3. *Catheterize urethra*, in prolonged cases.

P. M. Appearances : Those of *Asphyxial* death. Body *decomposes* rapidly, emits *smell* of H_2S , and its *muscles* are dark. *Nose* and *throat* are covered by a brownish viscid fluid.

II. Chronic Poisoning : Seen chiefly in workers in sewers, caoutchouc, rubber, phosphorus or sulphur.

Symptoms :

1. *Headache*, faintness. *Mental* excitement, mania, insanity. *Anaesthesia* of skin and mucous membrane. Paralysis.

2. *Nausea*, Diarrhoea, anæmia, *wasting*, *low fever* prostration. Weak pulse.

Tests : (1) + Acids = H_2S (2) + Pb-acetate = blackening.

CARBON DIOXIDE, CO_2 .

Similar Action of—Coal gas, Choke damp, After-damp, Exhalation from graves.

Medico-legal-points :

1. **Toxicity :** If the proportion of CO_2 in an atmosphere be 1 to 100 (1%) it is *poisonous* ; if it becomes 1 in 10 to 15 (10 to 15%) it is *fatal*. 1·2% coal gas inhaled for 1 to 2 hours

renders one unconscious. More than 9% of coal gas in any atmosphere breathed long is *fatal*. [It is not possible, from the amount of ashes present, to calculate the amount of gas produced or charcoal burnt. And manifestly, it is unjust to analyse the atmosphere after death, because gases diffuse very readily]

2. The gases used in warfare are : (a) *Asphyxiating*—N, H, SO₂ (2. 21 times heavier than air), chlorine (2. 46 times), Phosgene (3.49 times), Bromine vapour (5.36 times), Tetroxide of Nitrogen (3.17 times). Air + 0.04% chlorine is irrespirable (b) *Poisonous*—HCN, CO.

3. Danger of CO₂ depends on (a) the per centage of CO₂ actually present, (b) the amount of oxygen used up in its production, and (c) the amount of human organic exhalations. [As candles burn in atmospheres mixed with 10 to 12% of their volume of CO₂, *burning of candle in an atmosphere is no test of its safety for man to breathe it.*] Of the two gases, CO is more poisonous ; it often coexists where CO₂ is generated and its poisoning symptoms and treatment are practically the same as those of CO₂. Pure CO₂ is irrespirable : it excites reflex closure of air passages.

4. Death from CO₂ is often accidental, specially in natal chambers, and, in cold countries, from several persons sleeping with closed doors with a *slow* fire near. In Europe, painless suicides are often committed in this way.

5. Without causing harm, CO₂ like CO may be present in stomach in quantities much in excess of what would cause serious or fatal respiratory troubles.

Sources of Poisoning : Breathing air of—

1. Closed, crowded, lighted, small rooms ; holds of ships, old deep sewers, excavations in earth—cellars, vaults, underground railways, coal mines (specially after an explosion).

2 (a) Places near or over *lime-kilns*, where lime is preparing from "ghooting," (b) Places where chalk or lime has been thrown in, to neutralize mineral acids spilled before. Lime, thrown into places surcharged with CO_2 , absorbs a good deal of the gas.

3. *Decomposing* animal and vegetable matters in closed wells or rooms stacked with vegetables, sawdust, hay or grain ; or brewery vats where fermentation has been going on.

Symptoms :

I. Of injurious dose :—

CEREBRAL—Headache, *dizziness*, confusion of mind. *Ring- ing noise in the ears*, *sleepiness*. Insensibility, coma. Pupils—dilated. [*Facial paralysis*, in some cases.] In rare cases, *illusions* or *delirium* and *maniacal violence*. *Nausea* and vomiting. *Convulsions*—in some cases.

MUSCULAR—*weakness* and *relaxation* to helplessness.

CARDIAC *action* : At first exaggerated, then slowed. *Face* and body—pale or blue.

RESPIRATORY :—Pungent feeling in, and irritation of, nostrils. *Respiration*—quick, then stertorous, then difficult.

II. Of large poisonous dose, suddenly inhaled : *Immediate* death from spasm of glottis ; or, vomiting, *convulsions*, immediate insensibility and *speedy* death from apnoea.

Treatment : See under H_2S .

P. M. **Appearances** :—Those of death by asphyxia.

1. *Blood* (sometimes)—is cherry-red in colour, from presence of CO in it.
2. *Petechial hæmorrhages*—on back of throat.
3. *Body-heat* lingers long and *Rigor Mortis* is delayed.
4. *Tongue* is protruded and bitten.

5. Exudation of serum into ventricles of the *brain*.

Lungs are congested.

Tests : An atmosphere containing CO_2 , (a) will not support combustion, if CO_2 is over 15% ; (b) + CaOH or Pb -subacetate = white ppt.

CARBON MONOXIDE, CO .

Similar action of (1) Water gas = 40% $\text{CO} + \text{H}_2$, (2) Charcoal fumes.

Chemical Notes :

1. **Produced** wherever carbon is combusted either at *high temperature* (blast furnace), or in a *limited supply of oxygen* (as, during fires) or from wood-smokes, or in charcoal or coke-fire, *just before its kindling or going out*. It is not a *natural product of internal respiration and is odourless*. In small closed rooms, a man becomes so swiftly and completely helpless that he dies wherever he may lie ; in spacious rooms, death occurs, only if he lies near the fire.

2. **Toxicity** : Long-continued inhalation of minute quantities causes anæmia. Commencing within a few seconds, symptoms end fatally in 5 minutes with 1% CO . A man is rendered helpless with only 0.25% of CO .

To estimate amount of coal gas burnt, from the amount of ash remaining :—Add 96. 9% more to the quantity got.

Symptoms (Purely narcotic :—

I. **If slowly inhaled in small quantities** :—Same as those of CO_2 ; only, the symptoms are quicker in onset and surer.

II. **If inhaled in large quantities** : Immediately fatal.

Treatment : See under H_2S . Artificial respiration is perhaps useless ; use transfusion of *arterial* blood.

P. M. Appearances : Those of death from *asphyxia*. Body, lips, conjunctivæ, muscles, viscera, blood, p.m. stains—all are of *bright pink colour*. [Cp. p. 98.]

HYDROCYANIC (PRUSSIC) ACID, HCN.

Same actions of—Cyanides, Cyanates, Essence of peach, cherry or plum kernels or of mirbane, Essential oil of *bitter* almonds, Artificial Oil of *bitter* almonds. Aqua laurocerasi, Nitro-benzene, juice of *bitter* Cassava (*Jatropha manihot.*)

Medico-legal points :

1. Used invariably for **suicidal** purposes. It is *the most rapidly fatal poison known*, killing even in the very act of drinking it, though men have swallowed fatal doses and yet performed various voluntary actions, including walking.

2. The uttering of a **shriek**, invariable in lower animals, is found in man occasionally, at the last forcible expiration.

3. **Strength & Dose.**—Acid hydrocyanic dil, *m* 2 to 6 ; Aqua Laurocerasi, (0·1%,) $\frac{1}{2}$ to 2 dr. Essential oil of bitter almonds 5 to 15% and Chlorodyne 5% of HCN.

4. **The cyanides** act like the acid ; in addition, they are local corrosives. The *cyanates* are harmless. *Ferrocyanide* (not actively poisonous) if mixed with acids is poisonous. *Pot. Sulphocyanide* and *cyanuric acid* are both poisonous.

5. **Food & HCN.**—*Almond Flavour* (= 1 part essential oil of almonds + 7 parts spirit) or *Spirit of Almonds* or *Essence of Peach Kernels*—is about as strong as dil. HCN of B. P. *Bitter* almonds (240 grains of pulp), *bitter* tapioca, *kernel of plum, apple* (1200 to 2200 gr.) *apricot, peach, quince, loquat, sloe and cherry* (333 gr.) contain HCN. [Figures within brackets are equivalents of 30 *m* B. P. dil HCN].

6. **Commerce & HCN.** *Electro-plating solution* = KCN + Ag CN. [The *commercial KCN* is largely mixed with K_2CO_3 , hence, symptoms of poisoning by it may partake of the nature also of an irritant. KCN is used as a solvent of Ag stains by photographers, gilders, electroplaters for cleaning gold and silver lace, plates etc. and for extracting gold from quartz.

7. **Toilettes & HCN.**—Nitrobenzene or Oil of Mirbane, (much used in sweetmeats and perfumery) does not act before 2 hours and even inhalation of its vapour has caused poisoning. *Fatal dose* (swallowed)—gr. 15½. [Benzene has quite another action, *q. v.*]

8. The poison HCN is *rapidly eliminated* in breath; so that, chances of recovery improve, the longer patient can be kept alive.

9. **Detection** : Smell of it has been detected in stomach, a week after death. Though it may not be detected 24 hours after death, in some cases, it was detected about a month after death, although no smell of it could be perceived at that time. [CAUTION : (a) This gas is *not* generated as the result of putrefaction or combustion of the cadaver. (b) The amount of HCN in saliva is too microscopic to be a cause of death. (c) Before performing analysis, remove apple pips, cherry kernels &c. that are likely to evolve HCN, during analysis.]

Fatal dose : (1) *Pure Hydrocyanic Acid* (very unstable) = 1 m (=0.9 gr. Pure Anhydrous Acid) (2) *Acid Hydrocyan. Dil.* (2°/o) 50 m. (3) *Scheele's Hydrocyanic Acid* (5°/o)—20 minims. (4) *Solid (anhydrous) HCN*—gr. 1¾. (5) *Solid KCN* (41°/o)—gr. 5 [=gr. 2 of HCN] (6) Unpurified essential *Oil of bitter almonds* or peach nut oil (=5 to 15°/o)—1 dram. (7) *Aq. Lauro-cerasi* (0.1°/o)—1 to 2 oz. (8) *Nitrobenzene*—15½ gr. or less.

Fatal period : 2 to 10 minutes [Shortest, 1 sec. ; Longest-2 hours.]

Symptoms : Onset—almost immediate.

I. In non fatal cases :

Hot, bitter *taste*, *salivation*, *foam* in mouth.

Muscular relaxation : staggering.

Nausea. [Vomiting often leads to recovery].

Confused *Brain*, followed by Headache, Insensibility.

Face—pale, swollen. *Eyes*—staring, *Pupils*—insensitive.

Pulse, quick ; *Respiration*, stertorous and smelling of HCN.

II. In fatal cases :

1. After a few gasps and tetanic spasms of body, followed by muscular paralysis, there comes on immediate insensibility.

2. *Clenched fist*, *fixed lower jaw* and excitement of *genitals* ; involuntary evacuations. *Limbs* : flaccid. *Skin*—cold, clammy. *Face*—livid.

3. *Eyes*—staring, glassy. *Pupils*—dilated, insensitive.

4. *Pulse*—quick, weak, almost imperceptible. *Respiration* :—at first with convulsive, short inspirations and unduly prolonged expirations, soon becomes stertorous, deep and slow, terminating with a forcible expiration (sometimes, but not necessarily,—accompanied by a shriek). *Foam* in mouth.

Treatment :

1. *Keep up respiration artificially* and give fresh air or inhalations of chlorine (prepared by CaCl_2 + dil. acid) or hypodermic injection (every 4 hours) of $2\frac{1}{2}$ to 30° sol. of hydrogen peroxide ; or faradize phrenic nerves and diaphragm ; or apply cold and hot douche alternately to head, spine and chest (if body-surface is not already cold).

2. *Stimulate by*—warmth, hypodermic atropine (gr. $\frac{1}{50}$) with ether ($\frac{1}{2}$ dram) ; or, per rectum, spirit ammon. aromat or ether.

3. *Evacuate* by tube or by apomorphine. Wash stomach with 20° Hydrogen Peroxide.

4. *Neutralize by*—Pot. permanganate (5% solution), or, ferri sulph (gr. 15—2 drams) + tr. ferri perchlor. (20 min.) + magnesia or KOH, NaOH or Na_2CO_3 .

* Drops and minims : 10d HCN dil = 20m ; 10d Chloroform or tr. opii = 5 or 6m ; 10d of tr. aconite, tr. hyoscyami = 6 to 8m. (Woodman & Tidy).

P. M. Appearances : [Smell of HCN may not be apparent, if (a) body has been exposed to air or shower of rain (b) other odours are present, e.g., tobacco, peppermint &c.].

1. *Blood*:—dark, asphyxial in distribution. *Body* livid with odour of HCN. *Mouth*—foaming. *P. M. stains*—light red.
2. *Stomach* is a little congested. Contents smell of HCN.
3. *Fist*—is clenched. 4. *Jaws*—are firmly closed.
5. *Eyes* - are staring and glassy. 6. *Pupils*—are dilated.

To separate.—Distill viscera in CO_2 gas, surrounding the distillate jar (=HCN) by ice.

Tests. (1) *Silver test*: $\text{HCN} + \text{AgNO}_3 = \text{white heavy ppt.}$, insol. in cold dil. HNO_3 but sol. in hot strong HNO_3 ; this ppt. + HCl + boiling = HCN liberated; this ppt. well dried and heated in a reduction tube = cyanogen, which burns as a rose-red flame, with a blue halo. A watch-glass with a drop of AgNO_3 inverted over fumes of HCN gives this test, sometimes crystals of Ag-cyanide appearing. (2) *Iron or Berlin blue test*: $\text{HCN} + \text{KOH} + \text{FeSO}_4 + \text{Fe}_2(\text{SO}_4)_3 + \text{heat} + \text{HCl} = \text{ppt. of deep prussian blue.}$ Similarly, if we invert a watch-glass moistened with a drop of KOH over its fumes and then to it add the other reagents, we get same result. (3) *Sulphur test*: $\text{HCN} + \text{NH}_4\text{HS} + \text{heat} = \text{colourless crystals of } \text{NH}_4\text{SCy.}$ This + neutral ferric salt = red colour, which is destroyed by strong acids. Inverting watch-glass moistened with NH_4HS will also give this test. (4) *In organic combination*: Put it into flask (which may be occasionally warmed) and obtain any of the above tests by means of watch-glass inverted over mouth of flask.

CAISSON DISEASE.

[This is no poisoning, being death from compressed air].

Occurs in—(1) workers in immense iron cylinders which are filled with compressed air (2) divers (3) miners.

Death is due to—too rapid transition from high to low atmospheric pressure—resulting in air-emboli or irregular distribution of blood in the body.

Symptoms.—[Onset—some hours after leaving work]. Head-ache, vertigo, unconsciousness, irregular respiration, nausea, sweating, pain in extremities or epigastrium, *paralyses*.

Treatment.—Remove to airy room. Ergot, hot baths, sinapism to epigastrium, alcohol. *As a prophylactic*, reduce the pressure at the rate of one pound in 1 minute.

P. M. Appearances.—Those of focal embolism.

Medico legal points : (1) *The highest recorded working pressure* of compressed air is 50 lb per sq. inch. (2) The average *working pressure* is 45 lb endured for 4 to 6 hours per shift. (2) *The symptoms in chronic cases are :* loss of appetite, emaciation, congestion of brain and lungs, muscular and rheumatic pains. (3) At $2\frac{1}{2}$ atmospheric pressure, it is impossible to whistle and difficult to speak.

BELLADONNA, ATROPINE.

Deadly Nightshade, Dwale, Yebruj, Angurshafa, Suchi.

(The root, leaves and twigs of *Atropa Belladonna*, N. O., Solanaceæ.)

Same action of—*Hyoscyamus niger** (*Koh-i-bhang, Puka-Yila, Bangá, Khorasani vova* or *Ajowán, Bazrul*), *Hyoscyamine*, *Hyoscine* (F. Dose—gr. $\frac{1}{2}$ to $\frac{1}{4}$) *Duboisine*, *Homatropine*, *Solanum Nigrum vel Rubrum* (Garden night-shade, *Kakmachi, Kaista-sak, Gur-kamai, Makoya, Laghukabotthi, Kamoni, Piloodi, Kaboi-kake, Robatarikh, Qu-bus.saleb.*), *Solanum Dulcamara* (woody night-shade, bitter-sweet, *Anah-es-saleb*) and *Dalcamarine* ; *Solanum Tuberosum* (Potato, *aloo*—containing small percentage of solanin, which is destroyed during boiling).

Fatal Period.—A few hours. **Elimination.**—is *via* urine in 10 to 20 hours.

* *Hyoscyamus* poisoning produces—dryness of mouth and throat, violent throbbing of heart, *no mental excitement or sensory illusion*, overpowering sleepiness, rise in pulse beats, blood pressure and temperature.

Fatal Doses of :—Atropine—gr. $\frac{1}{2}$ to ii. **Extract—**over gr. iii. **Liniment—**i dram. **Berries—**over 6 in number.

Symptoms : Onset, 2—3 hours.

Secretions :—SALIVA :—*Mouth and throat—*relaxed, dry and hot, \therefore , *swallowing* is difficult, though constantly repeated ; **BOWELS :** relaxed. **URINE :** at first forcible and *increased*, then *suppressed* or *involuntarily* discharged ; there may be ineffectual attempts to void it (*strangury*) with priapism ; or urine may be *retained* (paralysis of bladder). Urine may contain *sugar*. [Urea, phosphates and sulphates are increased but not chlorides].

Circulation.—*Pulse* quickened, (120 to 160) *Temperature* and *Blood-pressure—*raised.

Breathing—rapid and deep. *Skin—*is dry. *Face & Neck—*flushed, and scarlatinoid *rash* all over body.

Eyes : *Pupils—*dilated and insensible to light (\therefore *accommodation* disturbed ; *vision*, confused—perhaps diplopia) *conjunctivæ* flushed, sparkling. *Eyelids—*swollen. Occasional *flashes of light* are perceived by patient.

Brain :—Giddiness : *Speech* is thick. Unsuccessful attempts at *vomit*. (cerebral effect). *Gait—*staggering.

Talkative wakeful *delirium* : has *hallucinations*, spectral illusions. Great *restlessness* : Extraordinary movements with hands :—*spins yarns*. *Paraesthesiae*, numbness of limbs. *Convulsions* occur in rare cases.

Prognosis : (a) *Drowsiness*, muscular *paralysis*, *lividity—*are found only in **fatal** cases. (b) In **favourable** cases, patient recovers gradually or may *fall asleep* (exhaustion) in the midst of his delirium and wake up *conscious* (though dazed) and better. [*Drowsiness is not an 'usual or at all characteristic symptom'.*]

Treatment :

Evacuate by—(a) pump or emetics ; (b) *purgatives* ; (c) *catheterization of bladder, repeatedly*. *Secure diuresis* : cup over loins ; hot hip sitz baths.

Neutralize in situ, by *tannic acid*, coffee, charcoal.

Antagonize by (a) *pilocarpine*, gr. $\frac{1}{2}$ [or tr. *jaborandi*, 2 drams] so long as pupils are dilated and skin is dry. Try also *Morphine*, gr. $\frac{1}{3}$ (only during excitement) *Physostigmine* gr. $\frac{1}{100}$ and *chloral hydrate* (d) Cold douche to head during excitement.

Prevent asphyxia—by alternate hot and cold douche to head ; mustard plaster to calves of legs ; **artificial respiration**. *Stimulate* by hot bottles, caffeine, or coffee enema.

B P. preparations : *Atropine*. $\frac{1}{200}$ to $\frac{1}{100}$ gr. *Ext. belladon.* *Vir.*, $\frac{1}{4}$ to 1 gr. ; *Succus belladon.* (1%) , 5 to 15 m. *Ext. bellad. alc.* (1%) , $\frac{1}{4}$ to 1 gr. ; *Supposit. bellad.* (gr. $\frac{1}{80}$) ; *Tr. bellad.* ($\frac{1}{20}$ gr. in 110 m.), 5 to 15 m. and 1 m. for a child 1 yr. old. ; *Empl. bellad.* (0.5%) ; *Ext. bellad. liq.* ($\frac{1}{4}$ %) ; *Lint. bellad.* (0.38 %) ; *Ungt. bellad.* (0.6%) ; *Ungt. atropine.* (1 : 50).

Medico-legal points :

1. Death is **suicidal** ; or, **accidental**, from taking eye-drops, over-dose of “anti-inebriety nostrums” or from absorption of external or *endermic* applications. [Herbivora and rodents are less susceptible to its action than man]. Atropine eye drops may cause hyperpyrexia.

2. **Chronic poisoning** is resorted to by interested parties to bring on *imbecility*.

3. **Atropine** exists in every part of the plant, particularly in the *root* of young plant (about $\frac{1}{3}$ to $\frac{1}{2}$ %) and in the *leaves* (0.41 to 0.49 %).

P. M. Appearances : Those of death by asphyxia.

Tests : [*Separated from organic mixtures by Otto-Stas process.*]

(1) Atropine sulph + NH_4OH = no crystals (*vs.* Morphine and Strychnine). (2) + potassio-mercuric iodide = dense white ppt. (3) + H_2SO_4 + H_2O + pot. bichromate = green colour.

DHATURA, THORNED APPLE.

Dhatura, Vumattai, Unmetta, Jowz-ul-mathil, Tatula, Ghurbhuli, Padayin khatta.

Seeds of *Datura fastuosa*, *d. tatula*, or *d. alb.* **Leaves** of *d. stramonium* (B. P.). **N. O.** Solanaceæ.

Fatal Dose : *Extract*—Gr. xvi. *Seeds*—100 or more (= 16 gr.) **Fatal Period :**—12 hours.

Symptoms : **Onset** within $\frac{1}{2}$ hour.

Taste—bitter. **Mouth and throat**—dry and congested (\therefore thirst, dysphagia).

Pulse is full, rapid. **Respiration & Temperature**—are raised. **Voice**—is changed, **articulation**—indistinct (spasm of pharyngeal muscles). **Skin**—hot and dry, with red rash. **Face**—is flushed.

Eyes—congested and prominent. **Pupils**—widely dilated : \therefore , **vision** blurred, and distant objects appear near and near objects appear magnified. [Vision continues obscured long after general recovery and pupils are dilated in all stages.]

Delirium.—*Restlessness*, convulsions, with *inco-ordination* of muscles, subsultus tendinum, ataxic gait and mind (\therefore talkative delirium, hallucinations of spectra, vermins etc., picking imaginary threads from tips of fingers.) Patient is very timid withal.

Coma : Drowsiness, stupor, coma (for even 2 or 3 days) Death or recovery commences with delirium (secondary).

Treatment : See Belladonna, page 270.

Medico-legal points :

1. Added to country-liquors, majun, ganja or to chillum,

(smoke),—*dhatura* increases their intoxicating powers and **accidental** overdoses thereby may be fatal. There is a variety of white *dhatura*, wild in the sub-Himalayan regions, whose leaves resemble those of *adhatoda vasika* (bakash) and which, used as such, in error, has caused poisoning. It is, however, used by professional road-poisoners (*dhatoorias*) for **homicidal** purposes, or, more correctly, for stupefying, to **facilitate robbery**.

2. The plant contains 1 % of *alkaloids* (Daturine, allied to atropine, and Scopolamine, allied to hyoscyamine) and is therefore dangerous. Leaves are less active than seeds. One hundred **seeds** of *d. alba* = 21 gr. ; of *d. fastuosa* = 10 gr. ; of *d. stramonium* = 12½ gr. Death may take place although the whole of the seed may be ejected per rectum.

4. *Dhatura* seeds **resemble** capsicum seeds outwardly, but not on cross-section. *Dhatura* seeds are bitter, ear-shaped and their embryo is arranged like the helix of human ear and iodine solution applied to embryo, gives a blue tint near the hilum of the seed.

5. The **black variety** (*d. fastuosa*) is said to be the strongest in **toxicity**. Next in decreasing order comes the *white variety*, then the *English variety* (*d. stramonium*). The *yellow dhatura* or 'feringi dhatura' is called *siál kántá* (argemone mexicana, n. o., papaveraceæ).

P. M. Appearances : Those of death from asphyxia.

Tests. [Separate from organic mixtures by Otto-Stas process.]
Test by instilling into eye, for dilatation of pupils.

CANNABIS INDICA (Vel SATIVA).

N. O. Urticaceæ.

Forms : [There is no alkaloid ; the active principle is a resin] (a) *Bha'ng*, *Siddhi*, *Sabji* or *Paha'riya' a'tar*—dried leaves in stalks (= 10 %), used as *infusion* or *pill*. (b) *Ganja*

=unfertilized flowering top with resinous coating; used as *smoke* in chillum (=20 %). (c) **Momeea, Charas**=scraped off resinous exudation; used as *smoke* in chillum (=40%). (d) **Majun**=extract of the leaves, taken in milk, ghee and sugar with dhatura and nux vomica as a species of *sweet-meat*. (e) **Haschish**=an intoxicating *liquor* containing bháng.

Fatal Dose (1) *B. P. Tincture*—m 7½ has been known to cause death. (2) *Extract* (B. P.)—gr. 6.

Fatal Period: 24--48 hours; *Onset* within half an hour.

Symptoms.*

Brief **excitement**: Talkative *mania*, *hallucinations*—sexual or pleasurable. Tingling and numbness of part or whole of body. Drowsiness, then **coma**: *Pulse*—full, slow. *Pupils*—dilated. *Eyes*—congested. *Skin*,—clammy. *Muscle*—relaxed. *Urine*—increased.

Treatment: As in Opium poisoning, page 255.

Medico-legal points:

1. Used to *facilitate* crime (*robbery*, rape etc.) **Suicide** and **accident** are common. **Homicide** is rare.

2. *Habitually used* (even 45 gr. daily) as an aphrodisiac, intoxicant, restorative or carminative by many people. If indulged in chronically, it may bring about *insanity* with *homicidal mania*. *Running amok* is also common after intoxication by it. (I. P. C. § 85, 86).

Tests.—*No chemical test*. Identify the plant by its *physical characters* and the resin by its *action physiologically* on animals.

* A *heavy, fatal* dose of Belladonna, Dhatura, Hyoscyamus or Cannabis Indica produces *immediate* unconsciousness, convulsion or coma and death.

CAMPHOR.

Karpur, Kafur, Karuppuram, Kapur.

It is the distillate obtained from chips of *Cinnamomum Camphora* or *Laurus*, N. O., *Lauraceæ*.

Children's Poisonous Dose (smallest) :—(1) *Camphor* gr. 10. (2) *Rubini's Spt. Camphor*—even 7 to 20 m. [Rarely fatal.]

Symptoms* :

Irritation : *Smell* in breath and vomit (if any). No purging. Burning *sensation* all over body. *Urine* : smarts ; frequent desire to micturate.

Excitement : *Giddiness*. Face flushed, *convulsions*. *Pupils* dilated. *Pulse*—quick, weak.

Depression : *Sight*—partially lost. Delirium, *coma*, muscular paresis. *Collapse*—skin cold, *dyspnoea*.

Treatment : Do not give any spirits.

1. *Evacuate*—by tube or emetics (mustard) and by brisk saline cathartic.
2. *Stimulate* : Brandy, friction ; warmth.
3. *Check convulsions* by—morphia or chloroform.
4. *Relieve coma* by—hot and cold douche alternately to the head ; blisters to calves and soles etc.

ETHYL ALCOHOL, C₂H₅OH.

Soorá, Mad, Sarab, Dároo, Nesha

Similar action of :—Fusel Oil ("faints"), Amyl alcohol, Methyl alcohol, Ethers.

Remember—that an unconscious individual, whose breath is smelling of alcohol, may have had the alcohol administered

* Young women sometimes habitually take camphor to improve their complexion ; weakness and pallor are the two only signs of such *chronic poisoning*.

to him by somebody else, as a medicine, during unconsciousness from other causes, or alcohol may have been taken with other poisons or alcoholism may coexist with other grave lesions.

Amyl alcohol (potato spirit, pear or apple oil,—the last one = amyl alcohol valerianate) is obtained from *fermenting grains*. It is strongly *narcotico-convulsant* and is occasionally an impurity of whisky. If, however, the whisky is kept long, before use, the amyl alcohol decomposes in the mean time into less dangerous aromatic ethers. **Methyl alcohol**, **carbinol**, **Columbian** or **Pyroxylic spirit**, **Wood naphtha** is obtained from destructive distillation of *wood*. *Methylated spirit* = 10 parts methyl alcohol + ethyl alcohol + Petroleum oil. *Industrial Methylated spirit* = ethyl alcohol + wood naphtha (5%). **Ethyl** or common alcohol is obtained from saccharine liquids by the growth of *yeast* or *ferment*. Alcohol has been prepared from—rye, wheat, barley, rice, maize, potatoes, molasses, bananas, apples, chicory roots, peat, straw, currants, oil cakes, sawdust. That obtained from grapes is *wine* (Brandy), from molasses, *rum*; from corns, *gin*, *Hollands*, *whisky*; from potato, *fusel oil* (which is most dangerous). **Tinctures** are solutions of *non-volatile* medicinal substances in alcohol (90 to 45%). **Spirits** are similar solutions of *volatile* medicinal substances in alcohol (90%)

Impurities, adulterants and additions to imported liquors:— H_2SO_4 , CaS_2 , salicylic acid, $CuSO_4$, cocculus indicus, arsenic, copper. So-called wines are blends of spirit and colouring liquids. *In country liquors*, preparations of opium, cannabis indica.

Fusel Oil (= propyl + butyl + amyl + other alcohols): Their action is much slower but more powerful and lasting than ethyl alcohol; they may cause convulsion, nystagmus, optic atrophy, hemorrhages from abdomen.—**Treatment**:—Stomach tube, strychnine, coffee, brandy by mouth or rectum. Pilocarpine, alkaline drinks, pot. iod., sodii salicylas.

Percentage strength of alcohol absolute in—

SPIRITS (distilled):—Absolute alcohol—99, Rectified spirit—90, Proof spirit or Spt. tenuior—49, Brandy and Liquers, Gin, Rum, Whisky, *Arrack*—48 to 56.

WINES (*fermented*) :—Southern wines (Madiera, Malaga, Marsala, Port, Sherry) - 14 to 18, Burgandy, Champagne, Hungarian wines—10 to 13, Claret, Hock, Sauterne or Moselle, Red or white French—8 to 11.

MALT LIQUORS—Ale, Beer, Cider, Lager Porter, Stout, *Taree* (toddy), *Pachwai*, *Handi*.—3, 5 or more.

Fatal Dose : (1) **Absolute Alcohol**—2½ to 5 oz ; for a child under 12 years, 1 to 2 oz. (2) **Sulphuric Ether**—1 oz.

Symptoms : [AFTER SWALLOWING OR INHALING]

I. (**Acute**) **Sudden excessive dose**—instantaneous reflex cardiac inhibition (death) ; or, serious cardio-respiratory depression.

II. (**Acute**) **Non-fatal dose**,—

(a) IF SIMPLY "DRUNK" : *Pupils*—sluggishly reacting. *Lips*—parched and sticky. *Expression*—vacant. *Gait*—unsteady. *Deep reflexes*—lessened. *Temperature*—subnormal. *Voluble ideas* but incoherently expressed. *Breath*—smells of alcohol. *Conception of passage of time*—vague.

(b) IF PATIENT IS COMATOSE :—He *can be roused*, by strong stimuli, to the point of muttering answers to questions. *Expression*—vacant. *Face*—cyanosed, flushed or pale. *Eyes*—congested. *Pulse*—full, bounding. *Respiration*—deep, slow, stertorous and *breath*—smells of alcohol. *Pupils*—contracted if patient is left undisturbed but dilated and fixed, if stimulated [If they react to light, it is a favourable sign.] *Skin*—perspiring and somewhat anaesthetic. *Temperature*—subnormal and equal on both sides of body. May *vomit*. *Muscular twitchings* may occur, but convulsions rarely.

III. **Chronic Alcoholism** is characterized by :

I. **MALNUTRITION** : *Skin*—becomes thin, soft ; *Bones*—light and brittle ; *Muscles*, *Blood-vessels* and *Glands*—under-

, fatty degeneration. *Parenchyma of tissues*—atrophy. *Fat*—storage is increased.

2. **VISCERAL IRRITATIONS** :—Pharyngitis, oesophagitis, gastritis, cirrhosis of liver and kidneys, atheroma, fatty degeneration of myocardium, tendency to bronchitis, bronchopneumonia, pneumonia, genital atrophy etc. [These cases rarely come into conflict with law.]

IV. Insanity due to Alcohol.—See under 'Insanity'.

Treatment : [*Ordinarily, a drunkard sleeps off his debauch ; treatment is called for in COLLAPSE or if COMA is attended with FIXED PUPILS : and then keep an eye on other possible complications*] [**Emetics and apomorphine may collapse**].

Wash out stomach (slowly) by tube ;—diuretics, diaphoretics and enema (if not collapsed) should follow.

Stimulate (if collapsed)—by warmth, coffee, strychnine, &c.

To keep down cerebral congestion—rouse him, pour cold shower on his head (not on the body, unless it be hot) or give amyl nitrite inhalation.

If maniacal—inject apomorphine (gr. $\frac{1}{6}$ hypod.) or give amyl nitrite inhalation.

In failing respiration—give artificial respiration. **Rouse him whenever the respiration is very slow.**

Diagnosis : See *Pp.* 168, 256.

P. M. Appearances :

1. *Odour* of it in lungs, brain and stomach (if seen early).
2. *Blood*—is asphyxial in character and distribution.
3. *Brain and Meninges* are congested, with serous effusion
4. *Stomach*—may be pale ; or congested and inflamed ; extravasations under, and denudation of, lining may be seen in rare cases. Perhaps no alcohol is found.
5. *Lungs* are hyperæmic. *Bladder*—is full.

Medico-legal points.

1. **Alcohol blunts senses.**—A heavy drinker loses sense of *taste* and *smell* considerably, and may drink, say, carbolic acid, without perceiving its taste or smell at the time !

2. **Legally speaking, "being drunk"** *per se*, is no offence ; if a person drunk becomes a source of *danger* or *annoyance* to himself or others, he is punishable, unless it is proved that he was made drunk *against* his *knowledge* and *will* (I. P. C. §§ 85, 86.)

3. **Coma** from alcoholism may be long postponed and then set in abruptly ; or it may set in early, be over temporarily, to set in again, perhaps, with **convulsion**. The **danger-signals** in **coma** from whatever cause, are (a) *pupils* inactive (to light) (b) *temperature*, lowered (c) *respiration* slowed.

4. **Suicide** by alcohol is rare ; **homicide** unknown ; most cases being fatal from **accident**.

5. **Death & Alcohol** :—A man may die from the effects of *alcohol* ; or he may die from the effects of *poison* taken with alcohol ; or he may get *apoplexy* or serious *injuries* owing to being drunk and die from these. Drinking predisposes a man to *apoplexy*, *cardiac* debility, and other visceral weaknesses.

6. **Ether** :—The action of ether is more rapid and evanescent than that of alcohol. Its intoxicating dose is—2 to 4 dr.

Separation :—(1) Suspected liquid (if acid) + Na_2CO_3 and distill. Distillate + fused CaCl_2 and distill again. To this distillate add excess K_2CO_3 , and set aside = Alcohol.

Test :—(1) Guaiacum + dil HCN + CuSO_4 = blue colour. (2) + NaOH + I + KI + heat = iodoform forms. (3) + sulpho-molybdic acid = blue colour (4) + $\text{K}_2\text{Cr}_2\text{O}_7$ + H_2SO_4 = green colour.

VERONAL.

Fatal dose—over 100 gr. [30 gr. have killed one case].

Fatal Period—24 hours to 4 days.

Symptoms :

Headache, vertigo, diplopia, staggering *gait*, drowsiness, coma.

Pulse—feeble. *Respiration*—shallow, stertorous with pulmonic œdema and cyanosis. *Temperature*—raised.

Urine—scanty, dark-coloured, sometimes retained.

Treatment : Do not use hot water.

1. *Evacuate*—by pump or apomorphine.
2. *Stimulate*—by coffee, nitroglycerine, pituitrin, digitalin &c.
3. *Catheterize* bladder and give diuretics.
4. *Purge* well
[Veronal should not be used along with the administration of *calomel*, or, so long as *calomel* is not completely eliminated from the system, nor to be given to *badly constipated* patient or those suffering from *renal disease*.]

Tests : (1) + HNO_3 + Millon's reagent = white ppt. (2) + Na CO_3 (dry) + heat = NH_3 given off.

COCAINE.

It is the alkaloid extracted from leaves of *Erythroxylon Coca*, n. o., Linaceæ.

Fatal dose :—15 gr. ; even $\frac{1}{4}$ grain (hypod. injected or applied to mucous surfaces—rectum, urethra, vagina, eyes &c.)

Symptoms :

I. Of non-fatal poisoning.

1. *Dryness of mouth*, difficulty in swallowing, *Vomiting*.
2. Headache, giddiness, faintness. *Intellectual faculties*—are momentarily brightened (\therefore excitement and delirium), to be soon depressed (\therefore , loss of mental controlling power). *Pupils*—dilated. *Taste, smell, hearing*—are all lost.

3. *Gait*—unsteady. *Tingling* and sensation of sands or worms under skin (Magnan's symptom). *Numbness* in various parts of the body (lips, mouth, abdomen &c.).

4. *Pulse*, *temperature* and *respiration* are increased but soon become depressed. *Skin*—shows scarlatinoid rash. *Urine*—may be suppressed.

II. Of fatal poisoning :—

1. Immediate or quick *insensibility* and epileptiform *convulsions*. *Pupils* are dilated, *eyes* staring.

2. *Pulse*—very rapid and weak. *Blood-pressure*—falls.

3. *Temperature*—is raised ; *skin*—towards end becomes cold, clammy and livid.

4. *Respiration*—at first quick, and regular, finally fails.

Treatment [*Maintain recumbent posture*].

Evacuate—by stomach pump [*Emetics* do not act].

Antagonize physiologically by—*morphia* hypod (gr. $\frac{1}{4}$ to $\frac{1}{2}$).

Stimulate by *digitalis*, *strychnine*, *coffee*, *amyl nitrite*, *brandy*, *saline injection*, *ammonia*, *ether*, **artificial respiration**.

Counteract convulsions by,—*chloroform* inhalation (partial anaesthesia), which failing, give *chloral* (cautiously).

B. P. Preparations : *Ext. cocæ liq.*, $\frac{1}{2}$ to 1 dr. ; *Cocaine* gr $\frac{1}{30}$ to $\frac{1}{2}$, *Cocaine hydrochlor*, $\frac{1}{20}$ to $\frac{1}{2}$ gr ; *Ungt. cocaineæ* ; *Inj. cocaineæ hypoderm.* (10%), 2 to 5 m ; *Lamellæ cocaineæ*, $\frac{1}{30}$ gr. each ; *Trochiscus Krameriaæ et cocaineæ* (gr. $\frac{1}{30}$ in each). **Non-official preparations :** *Ext. Cocæ* (0.13 to 1 gm), 2 to 15 gr. *Elixir cocæ*, 1 to 4 dr. ; *Inf. c.* (1 : 50), *Vin. c.*, $\frac{1}{4}$ to $\frac{1}{2}$ oz ; *Bougie*, *Pessary* or *Suppository*, $\frac{1}{2}$ gr. in each. *Ceratum* (1 : 30), *Collodium* (2%), *Emplastrum* (1 : 50), *Nebula* (2%), *Pastille* $\frac{1}{10}$ gr. in each. **Preparations of like property :** *Eucaïn hydrochlor*, gr. $\frac{1}{10}$ to $\frac{1}{2}$, *Holocaine hydrochlor*, *New orthoform* gr. $1\frac{1}{2}$ to 3, *Nirvanin*, *Tropacocaine hydrochlor*, (less toxic), *Acoïne*, *Anaesthesine*, gr. 3 to 8, *Alypin*, gr. $\frac{1}{10}$ to $\frac{1}{2}$, *Stovaine* gr. $\frac{1}{2}$ to $\frac{1}{4}$ (hypod). *Novocain*, gr. $\frac{1}{2}$ to 1 (hypod).

Medico-legal points :

1. Death is **suicidal** or **accidental**—hardly ever **homicidal**.
2. Used **habitually** as an aphrodisiac or narcotic by many men, with betel (*pan*)—containing $\frac{1}{2}$ gr. each—and thereby enormous *toleration* is established.
3. **Adulterants** of cocaine : Salol, Antipyrine, Phenacetin, Magnesii Sulph—all which are very cheap.
6. Chewing coca leaves may stain the **gums** dirty-green, but, eating cocaine should not **blacken** gum or teeth. Being very dirty and over-addicted to *pan*, cocaine-eaters' gums and teeth are very dirty.

Separation from organic mixtures by Otto-Stas' process. [If mixed with antipyrine, dissolve in $H_2O + NH_3$ and filter. The solution = antipyrine, the filtrate = cocaine]. Cocaine solution + Alum + a dried film of $KMnO_4$ = pale pink crystals of Cocaine permanganate, which are squarish and display play of colours under polarised light. [Alypin, Tropacocaine, Scopolamine produce crystals from aqueous solutions ; β -Eucaine, Stovaine, Novocain, Holocain and Nirvanin form no crystals].

Tests. (1) $+ H_2SO_4 +$ resorcin = blue colour ; this $+ NaOH$ = light rose colour. (2) $+ chromic\ acid$ = a ppt. which immediately redissolves. This $+ HCl$ = yellow ppt.

CHLORAL HYDRAS, $C_2H_3Cl_3O_2$

Similar action of :*—Chloralamide, Paraldehyde, Bromal hydras, Chloralose, Trional, Sulphonal, Tetronal.

Fatal Dose : (1) Chloral Hydrate—3 drams. (2) Syrup chloral (80 gr. to 1 oz.) = 3 oz. (3) Paraldehyde—2 ounces.

F. Period : 4—10 hours or more. Shortest, 15 min.

* Paraldehyde causes symptoms resembling delirium tremens with nausea, vomiting, giddiness, intermittent, slow pulse. Sulphonal upsets renal functions with cardiac depression and ataxia. Veronal irritates cutaneous and glandular systems.

Symptoms : [Onset—sudden]

Spinal :—*Muscular* power, *sensation* and *reflexes*—are depressed ; \therefore , exhaustion, langour.

Cardiac : *Pulse*—small ; later on, slow, weak and irregular.

Cerebral :—(a) Giddiness, stupor, *coma*. (b) *Pupils*—contracted (ultimately dilating). (c) *Blood-pressure*—falls markedly \therefore face, though occasionally flushed, is, like the extremities pale or livid and cold ; cold *sweat* breaks out ; *temperature* (after a preliminary rise) falls markedly (even to 91°F). (d) *Respiration* :—slowed, shallow (sighing or snoring) and irregular.

Cutaneous Rash ;—urticaria, scarlatina or purpura.

Treatment : [*Maintain warmth, consciousness and respiration ; do not exhaust*]

1. *Evacuate* by tube or apomorphine [**No emetics.**]

2. **Stimulate heart** : by warmth, flagellation, friction digitalis, physostigmine, picrotoxin, strychnine* (gr. $\frac{1}{16}$), coffee ether or ammonia, or alcohol per rectum or amyl nitrite inhalation, sinapism to nape of neck and præcordia.

Keep awake—by blister to calves of legs and soles of feet.

3. **Stimulate Respiration** by—faradic current, atropine.

P. M. Appearances : Asphyxial cerebral congestion.

Medico-legal points :

1. It is possible for a person to die and yet **no chloral** be found in the tissues of the body.

2. It is *not intrinsically highly toxic*, but is so, in diseased conditions of the heart. [Hence, note tension of pulse before giving chloral to any patient].

3. **Sulphonal** gives rise to non-albuminous, tawny, port-wine coloured *urine*, which is richly laden with urobilin or a derivative of blood pigment (hæmatoporphyrine) but no hæmoglobin.

* Strychnine is not so good an antidote to chloral as chloral is to strychnine.

4. After a *medicinal* dose of chloral, **sleep** comes on, and, may, after several hours, *suddenly* merge into *death*, without producing any symptoms ; or, after an *ordinary* hypnotic dose, a patient may awaken from sleep in a state of *deadly faintness* !

5. **Administration.**—Chloral has *no cumulative action* ; on the other hand, a single large dose of chloral, in rare cases, *acts with unexpected violence*. Twenty grains (1·3 gm.) is the highest safe dose of chloral ; this amount should not be repeated oftener than once an hour, and, when 60 gr. have been taken, not again for some hours.

6. *Idiocy* may be a rare **sequel** of acute chloral poisoning.

7. It is fatal by **accident** and its smell and taste are bar to its administration **homicidally**.

8. Under the influence of sun-light, KClO_3 **decomposes** chloral with violence.

Tests. (1) Suspected matter + KOH + heat (vapour passing through a redhot tube into a solution of AgNO_3) = free chlorine and AgCl . (2) + $(\text{NH}_4)_2\text{S}$ = in succession, opalescence, yellowish-red coloration, precipitation with evolution of smell.

CHLOROFORM. CHCl_3 (Methenyl Chloride).

Similar action of—Nitrous oxide (Laughing Gas), Bromoform, Bichloride of Methylene, Carbon tetrachloride.

(A.) WHILE BEING ANAESTHETISED * *As the risk of death is greatest during the first few minutes of anaesthesia, begin by a preliminary injection of atropine.*

* The three stages of chloroform anaesthesia are :—

	<i>First stage.</i>	<i>Second stage.</i>	<i>Third stage.</i>
	<i>(Wait !)</i>	<i>(Operate !)</i>	<i>(Danger !)</i>
<i>Consciousness</i>	Dulled	Abolished	Abolished.
<i>Sensibility</i>	Blunted	Abolished	Abolished.

F. dose—over 3% concentration. **F. period**—1 or more minutes.

Symptoms (Acute Poisoning)—(during *third* stage) :—

I. Type Respiratory. (Brunton).

1. *Sudden* cessation of respiration (from paralysis of its centre or mechanical causes) ; or,

2. *Deepening Cyanosis* and a few shallow, irregular, *crow-ing* breathings—followed by *fixed and dilated pupils*—death.

II. Type—Cardiac. (Hare)

1. *Increasing* engorgement of superficial veins, with convulsions ; or,

2. *Syncope*—pallor, pulse small, irregular ; *pupils, dilated and fixed* : death.

(B) WHEN SWALLOWED.

F. dose— $\frac{1}{2}$ oz. (orally) ; 1 dr. (per os). **F. Period** : 5—6 hours.

Symptoms.

I. Immediate.

1. Severe *gastro-intestinal irritation*. *Smell* in breath and vomit. *Collapse*.

2. *Insensibility* :—*respiration*—stertorous, then irregular, shallow, distant ; *pupils*—at first contracted and later, dilated.

<i>Corneal reflex</i>	Present	Gone	Abolished.
<i>Pupils</i>	Dilated	Contracted, but dilatable	Dilated widely.
<i>Breathing</i>	{ Quick & shallow ; or held reflexly	{ Slow, deep, & stertorous	Shallow, weak, & irregular.
<i>Pulse</i>	Quick, stronger	Normal frequency, or slow & weaker.	Quick, weak, intermittent.

II. Remote (a) Gastritis (b) Jaundice (c) Oedema glottidis.

Treatment

(A) When Chloroform has been swallowed :—Keep body strictly horizontal, head low. [Head should not be lowered in cases of RESPIRATORY failure]. Do not leave patient for some hours after, as relapses occur. Keep him warm.

1. Evacuate by apomorphine or tube. [No Emetics.]

2. Neutralize it (a) orally—by lavage with 2 litres of warm sesame oil or by solution of sod. carb ($1\frac{1}{2}$ drams to Oj) ; (b) Rectally—by sodii bicarb enemata.

3. Stimulate by hot flannels to praecordia, by brandy cautiously (per rectum, followed by olive oil, to relieve its smarting), ether and strychnine or atropine hypodermically.

Remove cerebral congestion by—Blisters to calves of legs and soles of feet, by alternate cold and hot douche to head.

In threatening heart failure,—lower the head—even completely invert patient ; try Amyl nitrite inhalation, Faradism or acupuncture of heart.

4. Keep up breathing by artificial respiration : lay patient flat with pillow under shoulders, keep air-passages unobstructed (clear air-passages of saliva, false-teeth &c.,) loosen all tight clothings, pull out tongue, very fully and rhythmically, 12 times to the minute ; give inhalation of oxygen, weak NH_4OH vapour, slaping the cheek and cardiac area, and by faradism of phrenic nerves.

(B) During Anæsthesia : Adopt, 3. 4, items just detailed.

(C) DELAYED POISONING (=Acidosis)—occurs in children and in adults, chiefly after laparotomy for any acute abdominal infection.

Onset—almost immediately after recovering consciousness, or any time within 48 hours. Fatal period—1 to 9 hours.

Symptoms :—Restlessness, anxiety, grating of teeth, acute *delirious mania*, merging into deepening *coma*. *Eyes*—dry, *pupils*—dilated.

Vomiting—violent, persistent, then yellow liquid (“beef-tea”) gradually containing blood (“coffee-grounds”). *Jaundice*. Rapid emaciation.

Inspiration—spasmodic, irregular, gasping ; *expiration*—ineffective. *Pulse*—small, rapid, irregular.

Temperature—at first subnormal, rises to 101° to 103° F.

Treatment :—[PROPHYLACTIC : Restrict *butter, cream, milk*; to patients about to be anæsthetized, give a well *sweetened* meal 3 hours *prior* to operation]

POSTOPERATIVE : (1) *Sodii bicarb* ($\frac{1}{2}$ dr orally, 2—8 dr rectally and 3 to 5% solution subcutaneously) should be freely and frequently given.

(2) Hot fomentation or mustard *plaster to epigastrium*.

(3) If necessary, *adrenalin solution* (1 : 1000), 5 to 20 m.

P. M. Appearances : (I) *When swallowed*—those of asphyxia, and gastro-intestinal inflammation, with smell in their contents. (II) *When inhaled*—those of asphyxia.

(III) *In delayed poisoning* : Fatty degeneration of *Kidneys*, *nervous system*, *muscles*, *mucous membranes* generally ; fatty infiltration of *liver* and pigmentation of it from disintegration of *red blood corpuscles*. *Acetone* in urine.

Medico-legal points.

1. **Stolen chloroformization**.—Persons *soundly* asleep may be chloroformed without being awakened. *Anæsthesia* cannot however be produced in any one *partially awake* or even *sleeping lightly*, without awakening him, or his knowledge.

2. CHCl_3 never causes unconsciousness in less than 2 to 10 minutes (according to concentration), when steadily inhaled ;

stories of 'instant' unconsciousness are therefore fraudulent. But *hallucinations* of assault, rape etc. may follow CHCl_3 anæsthesia, from stimulating action of CHCl_3 on erotic centres.

3. The same quality of CHCl_3 acts *more* powerfully but less lastingly, when *inhaled* than when swallowed. Two to 3% CHCl_3 in air is the **safety limit** for inhalation.

4. **Suicide** by CHCl_3 is rare ; **homicide** is rarer still. It is occasionally given to facilitate robbery and rape. Most of the fatal cases are **accidental**.

5. **Idiosyncracies** of chloroform narcosis are : (a) In the *intemperate* and *athlete*, the stage of excitement with muscular spasm and rigidity may persist after loss of consciousness ; and, in *drunkards*, this excitement at times cannot be overcome without grave danger to life. (b) *State of pupils* varies in the same stage of anæsthesia ; in complete anæsthesia, it may be widely dilated (syncopal) or contracted (asphyxial).

6. **Death during anæsthesia** in *any* stage, from *sudden* cardiac inhibition is the result of ventricular diastole due to *intermittent* or *too light* anæsthesia or to light anæsthesia + *adrenalin* injection or to *accidents* (falling back of tongue, inspiring vomit or blood etc) ; to *want of skill* and ordinary care on the part of anæsthetist, to fatty or flabby heart, status lymphaticus or idiosyncrasy. **Death in delayed poisoning** occurs in cases suffering from diabetes or prolonged starvation or in very fat children.

7. N_2O is thoroughly safe and its insensibility is produced in anything from 20 to 200 seconds. When fatal, it is so within a few minutes. Its fatal dose is unknown.

8. **Danger Signals during anæsthesia** —(1) PULSE is weak, irregular, *slow*. [Quickened pulse = patient is coming out and will be sick : confirm by pupils and corneal reflex]. (2) PUPILS are *widely dilated* + *corneal reflex* is lost (3) RESPIRATION instead of being loud, tends to become *too quiet*. [Operation in ano genital region causes stertorous breathing].

Detection : Separation :—Distill lungs and blood very soon after death. **Tests :—**The distillate has peculiar odour of CHCl_3 . If this distillate is vapourized and the vapour passed through red hot tube, we find Cl (by blue colouration with iodised starch paper) and HCl (which causes white ppt. in AgNO_3 solution.)

KEROSENE. C_6H_6

Refined Petroleum, Coal-, Illuminating-, Rock-, or Paraffin oil. Photogen.

Similar actions of :—Gasoline, Lubricating oil, Petrol, Petroleum ether or spirit (Rhigolene), 'Composite paints', Mineral Naphtha. *All these are intensely inflammable.*

Fatal Dose (for child)—i to ii ounces.

Symptoms : [*Sudden death and relapses are common.*]

(A) **When Kerosene is drunk :**

1. **GASTRO-INTESTINAL :—***Burning sensation* in mouth and stomach. *Meteorism.* Odour in vomit, oily urine, breath and foeces.

2. **CARDIAC :—***Collapse* with cold sweats. *Pulse* weak, *Face* cyanosed or pale.

3. **CEREBRAL :** Drowsiness, stupor, *coma*. Occasional convulsions. *Breathing*—laboured. *Pupils*—contracted.

(B) **When Petrol fumes are inhaled :—**

1. *In small quantities :* Taste is perverted, dysphagia ; sickness, headache, giddiness.

2. *In large quantities :* Collapse, Coma, Cyanosis.

3. *Chronically :* Peripheral neuritis, imbecility.

Treatment :

1. *Wash out* stomach. *Purge.*

2. *Stimulate.* Warmth.

3. *Evacuate* by enemata with assafoetida, magnes, sulph. or other purgatives.

FORMALIN, Formic Aldehyde.

Symptoms : Irritant.

Treatment : Ammonia in small doses. (=urotropin).

BENZIN, BENZOL (Coal or Mineral Naphtha.)

Fatal Dose—3 drams. *Inhalation also poisons.*

Used in—dry-cleaning, dyeing, glove-cleaning, water-proofing.

Symptoms :

1. *Excitement*, flushing of face, noises in the head, dilated, insensitive pupils, headache, delirium, *coma*.
2. Muscular *convulsion*, occasional *paralysis*, trismus.
3. *Collapse. Respiration*—slow, irregular, stertorous. Distension of abdomen.

[Odour persists in breath for 2 or 3 days after recovery]

Treatment :

1. *Evacuate* by pump or emetics.
2. *Keep up breathing*—artificially or by faradism.
3. *Stimulate* by—brandy, ether, atropine, strychnine, &c.
4. *Rouse up* by—alternate hot and cold douche to head.

TURPENTINE (Oil or Spirit)

Similar action of :—Camphine, Pinene, Pinus, Pneumococcine, 'Sanitas', Terebene, Terebinthin.

Fatal Dose (for *children*) : $\frac{1}{2}$ ounce. [The B. P. doses (for adults) are : 2 to 10 m or 3 to 4 dr. Both these *extremes* of doses are safe ; *intermediate doses are unsafe*.]

Symptoms : (Cp. Opium poisoning.)

1. *Gastro-intestinal* irritation : *vomiting* and *bloody purging*.—both smelling of turpentine.

2. Delirium, somnolence, *convulsions*, *coma* ; *pupils* are contracted ; paralysis of *sensation* and *reflexes*.

3. *Respiration*—stertorous, smelling of turpentine.

4. *Urine* :—Irritable bladder or anuria or hæmaturia, or oily, albuminous urine, with odour of violets [urine excretes the poison.] *Cutaneous erythema*.

Treatment :

1. *Evacuate by*—tube or apomorphine and also *purge by* mag. sulph. Give demulcents, morphine.

2. *Relieve kidneys by*—dry cupping.

SALICYLATES, "ASPIRIN."

Symptoms :

CEREBRAL : *Vomiting* ; tinnitus, deafness ; drowsiness, delirium, coma. *Respiration*—deep, then dyspnoeic. *Urticaria*.

HAEMORRHAGE from nose, gums, with urine and into retina (∴ blindness &c.)

URINE—contains albumin, acetone.

Treatment :

1. Suspend use of drug. 2. **Purge** freely.

3. Alkalinise Urine by large doses of **soda bicarb.**

Medico-legal points :

1. So long as patient is getting large doses of sodii bicarb. and his bowels are free, there is little risk of poisoning.

2. During chorea and rheumatism, an adult may get even 150 grains of sodii salicylas per diem.

3. *Aspirin* (or Acetyl sodii salicylas) is more apt to cause poisoning than sodii salicylas (*artificial*) and the latter more quickly than the *natural* salt.

4. During administration of salicylates, patients see *disagreeable visions* from stimulation of optic nerve.

CARBOLIC ACID C_6H_5OH

Oil of Tar, Phenol, Phenic Acid (alcohol.)

Similar actions of : Kresols (Bactox, Cofectant, Creolin, Cyllin, Hycol, Izal, Jeys' Fluid, Kelvolin, Kerol, Krysyl, Lysol, Trikresol *etc.*), M. O. H. Fluid, McDougall's *Fluid*, Okol, Phenyle, Picric Acid, Pearson's Fluid, Resorcin, Calvert's disinfecting powder, Creasote, Zotal.

Sources of poisoning : (a) *Drinking* the raw acid or its lotions *intentionally* ; or, *by mistake*, in the dark, for wines or spirits or other medicines. (b) *Absorption (accidentally)* from cavities of body, injected with carbolic lotions or from compresses or ointments or pure carbolic acid applications to skin.

F. Dose : 1 dr. or more. **F. Period :** 3 min. to 4 hours.

Symptoms : [Onset—immediate.]

I. Of drinking non-fatal dose :—

GASTRO-INTESTINAL : *Lips* and *mouth* are burnt white, shrivelled, and hardened. Intense *burning sensation* from lips to stomach ; profuse *salivation*. *Smell* in vomit,* which is bloody.

CEREBRO-SPINAL : Rigors, headache, delirium, insensibility. *Reflexes* abolished. Convulsions, trismus. *Pupils* contracted to pinhead-size. *Urine* scanty and dark-olive-green or suppressed.

COLLAPSE : *Skin*—livid, dry, harsh ; then, cold, clammy, moist. *Pulse*—rapid, thready. *Respiration*—irregular, shallow and smells of it.

[Patient may die suddenly, after temporary improvement.]

* Ordinarily, there is no vomiting in carbolic acid poisoning. Creasote causes vomiting and purging.

II. Of drinking fatal dose.

Immediate *insensibility*. *Respiration*—stertorous, quick. Rigidity of limbs or *convulsions*, *trismus*. *Collapse*.

Treatment :—

1. *Evacuate**—by *apomorphine* or tube.
2. *Neutralize*—by repeatedly washing out stomach with magnes or sodii sulphate ($\frac{1}{2}$ ounce) followed by 10 % alcohol (whisky) and water ; or, Inject hypodermically or intraperitoneally, sodium sulphate—*never* magnesium. May try—*caffeine*, *tr. iodi* (same quantity as carbolic acid swallowed), *liqr. sacchar. calcis* (1 dr. to 1 pint), alkalies or *glycerin* and water (1 in 20).
3. *Give demulcents* : egg, milk, olive oil, &c.
4. *Stimulate* by—warmth, injection of saline solution, camphorated oil, or *atropine* or amyl nitrite inhalation. Give *artificial respiration*.

P. M. appearances :

1. In MOUTH, GULLET and STOMACH:—White or *brownish*, *leathery*, brittle sloughs, with inflammatory redness ; or, these are softened and grey, with hæmorrhagic points. INTESTINES—are frequently inflamed. *Smell* of carbolic acid in every viscus.
2. CEREBRAL and PULMONIC—congestion.
3. BLOOD—is dark or smoke-coloured and coagulates imperfectly.
4. LIVER and KIDNEYS :—Fatty degeneration.

Medico-legal points :—

- (1) Ordinary “acid” contains 80% phenol. Its *reaction* is *not acid*.

* As carbolic acid anæsthetises stomach, direct *emetics* do not act. As it is not a strong corrosive, *stomach tube* may be cautiously passed in, but owing, on the one hand, to the local anæsthetic action of the acid, and, on the other, to *spasms in the œsophagus*, any injury done by passage of tube will not be realized.

(2) **Marks** of acid on lips, front of chest, floor &c. may be **absent**, if, as in children, it is given by spoon.

(3) After apparent improvement, **sudden death** may occur.

Tests : (1) Aqueous solution + ferric chloride = blue colour.
(2) + Br-water = yellowish white ppt. (3) + NH_4OH + chlorinated water = blue colour, which becomes red on acidulation.

CONIUM.

Spotted Hemlock, *Showkaran*, *Kirtamana*.

Leaves and fruit of Conium Maculatum, **N. O.**, Umbeliferæ.

Similar action of :—Sparteine, Curarine, Staphysagrine, Methyl-strychnine, Methyl-brucine, Methyl-thebaine, Cystisine.

Fatal Dose : *Conine*—1 drop. **F. Period :** 1 to 4 hours.

Symptoms :— **Onset**—within $\frac{1}{2}$ hour.

Gastro-intestinal : vomiting, pain in stomach, diarrhœa.

Spinal :—Gradual paralysis of all *voluntary muscles*—starting from upper extremities and running on to trunk and lower limbs.

Ocular :—*Pupils*—dilated and fixed (\therefore accommodation is impaired) ; ptosis.

Respiration tends to fail and death is always by *asphyxia* (\therefore coma and convulsion precede death). Burning and constriction-sensation in throat, inability to swallow, thick speech.

Treatment :

1. *Evacuate*—by stomach tube or emetics (mustard).
2. *Neutralize it in situ*—by tannin, (strong coffee &c.)
3. *Stimulate* : warmth ; atropine gr. $\frac{1}{100}$, Strychnine gr. $\frac{1}{30}$

hypodermically, artificial respiration, even when respiration is failing for hours. Also massage.

Medico-legal points : (1) This poison was used to kill **Socrates**. Usually, cases of poisoning by it are *accidental*. **Active principles** are—conia (cicutine, conicine), conhydrine.

2. *Every part of the plant is intensely poisonous. Goats, sheep and horses eat it without harm.*

3. **Other poisonous Hemlocks** are : *ÆTHUSA CYNAPIUM* (Fool's Parsley or Lesser Hemlock), *CICUTA VIROSA* and *MACULATA* (cowbane), *ORNANTHE CROCATI* (Dead Tongue),—all which act as gastro-intestinal irritants and cause collapse and convulsion.

Separation by Stas' process. **Tests**—(1)+alloxan solution = colouration, followed by formation of purple red and white needle shaped crystals, soluble in cold potash lye (2)+ Hg. Cl_2 =white ppt. (7's. Nicotine)

COAL-TAR DERIVATIVES

Alypin, Anillin, Anillin oil, Antifebrin (Acetanilide), Antipyrine, Antisepsine, Exalgin, Guaiacol, Methylene Blue (Pyoktanin) Naphthaline, Phenacetin, Pyrogallol, Pyramidon, Resorcin, Stovaine, Sulphonal, Thiocol, Thalline &c.

Occurs in : *Patent Medicines* for cure of—Catarrh and cold, Headache, Neuralgia, Drinking Habit ; in several varieties of marking, *typewriter* or other *inks* ; in *dyes* for clothing and leather (yellow boot polish), *cosmetics*, *confectionary* and *pencils* of anillin (red, blue, copyink &c.)

F. dose—dr. 6 or less. **F. Period.**—uncertain.

Symptoms.

GASTRO-INTESTINAL irritation. *Nasal catarrh* in some cases.

COLLAPSE : *temperature* falls ; Face—*pale*, Lips—*cyanosed*.

Pupils—dilated. *Dyspnoea*.

NAFCOTISM :—drowsiness, stupor, coma.

Muscular prostration ; convulsions, trembling.

URINE—dark coloured, containing albumen.

Treatment : [*Recumbent posture & fresh air essential.*]

1. *Evacuate* by tube, mustard or ammon. carb.
2. *Stimulate heart* (well and freely) by—warmth, strychnine gr. $\frac{1}{23}$, intravenous saline injection.
3. *Stimulate respiration* artificially ; or, by oxygen, fresh air.
4. *For salivation* :—Astringent or pot. chlor. gargles.

Post mortem appearances : Blue coloured blood.

Medico-legal points :—**Anilin** (Aniline, Anilline).—Its *sulphate* and other salts, when pure, are inert ; its *hydrochlorate* is poisonous, as also are coloured boots and the brilliantly coloured *fabrics* dyed by anilin (some of them containing *arsenic*) *It is absorbed by unbroken skin, mucous surfaces, and air passages and acts as a powerful narcotic poison.* Hence, children wearing coloured socks, or sucking coloured toys, have suffered. Some of the so-called aniline dyes are not aniline at all.

2. During the **menstrual** period, women taking drugs of this group are particularly **prone** to be collapsed.

3. Those exposed to the fumes of aniline-derivatives or benzene-compounds suffer from **methaemoglobinaemia**—a condition characterized by (1) *cyanosis*, (2) *offensive diarrhoea*, (3) *weakness*, *dimness of vision*, *vague pains* and a feeling of *collapse*, and (4) *eczematous* skin eruption.

Separation : **ANILIN** : alkalinize, then distill and separate with ether. **ANTIFEBRIN** : shake with ether. **ANTIPYRIN** : alkalinize and shake with CHCl_3 .

Tests : **ANILIN** : (1) + bleaching powder = purple colour. (2) + Hg_2Cl_2 = crimson colour. **ANTIFEBRINE** : + Pot. bichrom + H_2SO_4 = red, turning green. **ANTIPYRIN** : + Fe_2Cl_6 = dark red colour.

NEUROTICS.

STRYCHNINE, NUX VOMICA.

Poison Nut. *Visha-tindook, Kuchila, Yettimaram. Munstingunja, Musada, Kalk-faluz-mahi, Karaskar, Jhera-koch-lang, Culaka kajara, Ifraki, Ettik-Kottai.*

Seeds of *Strychnos Nux vomica*, **N. O.**, Loganiaceæ.

Similar actions of—Absinthe, Brucine, Calabarine, Curarine, Nerium odorum, Picrotoxin, Thebaine, Upas tree.

B. P. Preparations : *Strychnine*, & *hydrochlor*, gr. $\frac{1}{80}$ to $\frac{1}{15}$; *Liqr. strych. hydrochlor* (1%), 2 to 8 m; *Nux vomica*, 1 to 5 gr.; *Ext. Nucis vom. Liq.* (1½%), 1 to 3 m; *Ext. nux. vom.* (5%) $\frac{1}{4}$ to 1 gr; *Tr. Nux. vom.* (25%), 5 to 15 m. **Patent medicines :** *Fellows' Comp. Syr. hypophosphites* ($\frac{1}{160}$ gr. in a dram), *Huxley's syr. Nervigor*, *Easton's syrup* (gr. $\frac{1}{32}$ per dram) and most "tonic" and *aphrodisiac* medicines, "*vermin killers*," (each packet = 1 gr.) and "*dog poisons*."

Fatal dose : (a) *Strychnine* gr $\frac{1}{2}$ – 2 (for adults); $\frac{1}{16}$ gr. (for a child of 3 years) (b) *Powdered seed*—30 grains (= weight of 1 seed = $\frac{1}{3}$ grain of strychnine.) (c) *Ext. Nucis Vomicae*—3 grains.

Fatal Period.—5 minutes to 2 hours.

Causes of Death : (1) *Asphyxia* during convulsions. (2) *Exhaustion* from convulsions.

Symptoms : **Onset**—5 minutes [Later in *Nux Vomica*.]

1. Persistently bitter taste in mouth, dry tongue, thirst.
2. *Restlessness ; shooting pains*—in back, down the arms and legs ; anxiety, sudden shudderings and feeling of impending suffocation ; face is alternately pale and red.
3. A tremor of the whole body, followed by general, tetanic CONVULSIONS—commencing suddenly and violently ; resulting in *opisthotonos*, with "*risus sardonicus*," lasting $\frac{1}{2}$ to 2 minutes ; may be so severe as to give rise to extensive bruising of muscles, and

to erection of penis, with involuntary emission of semen, urine and foeces. [*Lower jaw is last affected and may not be fixed during paroxysm. There is complete relaxation of muscles between spasms.*] Pupils are dilated during paroxysms and contracted during relaxation. Pulse—extremely rapid. Cyanosis and collapse. Temperature rises.

4. Hearing and sight are acute. Consciousness remains to the last, until asphyxiated by tetanic convulsion of whole body. *No narcotism.*

Prognosis : Convulsions get longer and more frequent, if patient is going to die ; the contrary, if he is going to recover.

Treatment. [*Apply chloroform at once, if patient is much convulsed. Touch patient as little as possible.*]

1. Evacuate by—stomach pump (under chloroform), or by apomorphine (gr. $\frac{1}{6}$). *Unless seen in the beginning, do not attempt to evacuate contents of stomach.*

2. Neutralize by—tannin gr. 30, tr. iodine $\frac{1}{2}$ dram, iodide, pot. permanganat \bar{a} , or charcoal.

3. Physiologically counteract by—chloral (1 dr.) and bromide ($\frac{1}{3}$ ounce per rectum or even subcutaneously, to be repeated every 20 minutes, in doses of 15 gr. and 2 dr. respectively.) Tobacco or aconite may be given cautiously. Control fits by—keeping in quiet, dark room, by inhalation of chloroform, ether, or of amyl nitrite.

4. Relieve asphyxia by amyl nitrite (m v) hypodermically.

P. M. Appearances : Those of asphyxial death. There is *post mortem rise of temperature*. Rigidity of limbs, etc., just as in other bodies. *Muscles ruptured.* [See p. 124]

Diagnosis :—

	Idiopathic Tetanus	Hysterical Tetanus	Strychnine Poisoning
Onset	.. Gradual.	Gradual.	Sudden

<i>Lower jaw</i> ...	First and specially affected.	Sets in before, and remains between fits.	Last affected. Drops when convulsion ceases.
<i>Relaxation between fits.</i>	Never complete.	Not complete.	Quite complete.
<i>Progress</i> ...	Uncertain	... ..	Steady (for worse or better.)
<i>Eyes</i> (during fits).	Open, rigidly fixed.	Closed...	Stretched wide open.
<i>Consciousness</i> ...	Present	... Lost ...	Present.
<i>Cries</i> ...	Complains bitterly of pain	Sobbing, childish crying.	Scream with pain.

Convulsions occur in :—anæmia of brain (sudden), asphyxia, cerebrospinal meningitis, epilepsy, general paralysis of the insane, hyperpyrexia, hysteria, poisoning by arsenic, HCN, picrotoxin and by tobacco, in worms, sunstroke, tetanus, uræmia.

Medico legal points :

(1) **Toxicity of Plant.**—*Strychnos nux vomica* leaves contain 0.3 per cent. brucine, the bark and wood contain brucine and the pulp of the fruit contains strychnine, though eaten with impunity by certain birds. An entire *nux vomica* seed, when eaten, passes out of human body without poisoning, because, its testa is hard. The *Nux Vomica* seeds contain 0.2 to 8.5% strychnine and 0.12 to .1% brucine. The seeds of *S. Ignatii* contain strychnine 1.5% and brucine 0.5%. The poisonous plants of *strychnos* genus are—(1) *S. Colubrina*, Snake wood, *Koochila-lata*, *Goagari lakri*, *Deva kadu*, *Nagamusadi*, *tansoopau*. (2) *S. Ignatia*, St. Ignatius's bean, *Papita*, *Kayappau kotai*. (3) *S. Tieute*, Upas Tree of Java. (4) *S. Toxicaria*. The non-poisonous plant is the *S. Potatorum*, *nirmali*, *nivali*, *tetrakotai*.

(2) Strychnine is physiologically antagonistic with—
(a) *Chloral* and *Morphine*—as regards cerebrum. (b) *Calabar bean* and *Gelsemium*—as regards anterior cornua of spinal cord.

(3) Pure strychnine is practically **insoluble** in cold water but its salts are easily soluble.

(4) **Homicidally**, strychnine can be given disguised in quinine or cathartic pills, without exciting suspicion. Though occasionally used **suicidally**, most fatal cases are **accidental** from (a) over dose—in habitual nux vomica eaters, (b) wrong dispensing in place of santonine, salicin, rhubarb, jalap or kurchi (holerrhena antidysenterica), (c) taking dog or vermin poisons, (d) eating flesh killed by this poison, or (e) giving the B. P. (1885 liqr. strychnine (an acid preparation) with an alkali. From 1898, the liqr. strychnine has been made a neutral preparation.

(5) Being very stable, strychnine can be detected in **putrid bodies, years after their burial**. Its *absence* in corpses indicates death from other causes or from taking small but fatal quantity. Some alkaloids, non-existent in the living, are generated by putrefaction, in dead bodies, and they answer to the chemical tests of strychnine and thereby lead to wrong inferences. (R. vs. Buchu, Bomb. H. C., 1891. See p. 244.

(6) **Habit & Tolerance**.—In this country, many people habitually eat nux vomica seeds morning and evening to increase sexual powers or general bodily strength. They begin with $\frac{1}{16}$ th part, till they eat an entire nut (= 30 gr.). A fair amount of tolerance is thus established ;—here strychnine does *not* act as a cumulative poison, though an accidental increase of the dose may cause poisoning in them. Ordinarily, however, strychnine does act as a *cumulative* poison. Persons suffering from palsies are very much **susceptible** to its action, specially on their affected parts ; so do persons with **idiosyncrasy** towards it.

(7) **Non-absorption**. According as the stomach is *empty* or *full* or contains *tannin* or *fat* or according to the condition of its *mucous lining* (as in cholera) or of *blood vessels*, strychnine **may not be absorbed** although lying for an hour in stomach.

Separation : (I) *From organic compounds*—by Otto-Stas' process—in ether and chloroform. (II) *From powder* by digesting suspected powder with H_2SO_4 . Heat it to dryness, then add H_2O and filter. To filtrate + KOH + ether = strychnine.

Tests for strychnine (1) Intensely bitter taste (even 1 in 70000) (2) Sparingly soluble in H_2O but readily soluble in ether, alcohol, benzole, $CHCl_3$ (3) + H_2SO_4 = no colour change ; then, + MnO_2 = change of colour from blue to purple to crimson to brown to bright red (vs. Brucine). (4) Sublimed on covered crucible, it is deposited in several milk white circular spots. (5) Physiological test on frog. (convulsion).

Test for Brucine : + HNO_3 strong = bright red colour. This + heat = yellow colour. This + stannous chloride—yellow changes to purple, destroyed by excess of HNO_3 or $SnCl_2$.

ACONITE.

Monkshood, Wolfsbane, Blue rocket. *Bikkh, Mitházahar, Visha, Dudhiyábish, Sringá-bish, Kát-bikkh, Mithá-bish, Ati-bishá, Atalasanikali, Batsa-nábh, Bachnab, Vishnavi.*

Leaves and root or Aconitum Napellus, **N.O.**, Ranunculaceæ.

Similar action of—Delphinium Staphysagria.

Fatal dose : (1) *Aconitine* gr. $\frac{1}{16}$ — $\frac{1}{8}$. (2) *Pseudo-aconitine* gr. $\frac{1}{10}$ to $\frac{1}{8}$. (3) *Ext. Acon.*—gr. 2—4. (4) *Tinct. Acon.*—1 to 3 dr. (1 : 20.) (5) *Fleming's Tinct*—25 min. (= 6 × B. P. tincture.) (6) *Powered Root*—1 dram or less. (7) *Liniment Aconiti* (1 : 1½)—m x—xx.

Fatal period : $\frac{1}{2}$ to 4 hours.

Chemical Notes.—Aconite has 4 varieties (in descending order of toxicity) :—(1) A. FEROX, *Dukra* or Nepali poison. (2) A. NAPELLUS. (3) A. Palmatum, *Bikkhma, Bishma, Wakhma.* (4) A. HETEROPHYLLUM, *Atis, Ativadyam, Ativishá, Ativakha-in-kali dyam, Ativakha* [Other varieties : A. LURIDUM, A. LYCOCTONUM.]

The aconitines : *Commercial aconitine*, = a mixture of aconitine, pseudo-aconitine, picraconitine. *English aconitine* is 17 times more active than *German aconitine* ; *Merck's* is 30 times as active as *Friedlander's* ; *Petit's*, 8 times as active as *Merck's*.

Symptoms : [Onset—within 3 to 5 minutes]

1. **Sensory stimulation, followed by its paralysis :** *tingling* sensation at first in *lips* and *tongue* (\therefore *salivation*) ; sensation of constriction in throat (\therefore *dysphagia*) and in stomach ; then follow creeping sensation and numbness all over the body.

2. **Gastro-intestinal irritation :** warmth and tenderness at pit of stomach ; retching, vomiting, gripes, pain and purging.

3. **Motor paralysis :** at first *tremors* and *jactitations* ; then muscles become flaccid (\therefore *staggering*) followed by paralysis first of lower, then of upper, extremities.

4. **Cardio-respiratory failure : Collapse :—**(a) *Pulse*—small, slow, then quick, and again slow before ceasing (\therefore *syncope*—with impaired vision and hearing). (b) *Temperature* sinks ; with copious sweating (\therefore *anuria*). (c) *Respiration* : slow and deep, then irregular and spasmodic (\therefore *restlessness*, even convulsions).

5. *Pupils*—at first alternately dilate and contract, then, dilated and fixed. *Consciousness* present all through, *narcosis* supervening only in some cases.

Treatment [Keep recumbent, extremities elevated.]

1. *Evacuate* (cautiously) by ammon-carb or pump.

2. *Neutralize locally* by—*tannin* (coffee) or animal charcoal.

3. *Stimulate*—by hypodermic *atropine* (gr. $\frac{1}{100}$), tr. *digitalis*, $\frac{1}{2}$ dr. by mouth or 10 m hypodermically. Warmth ; dry friction (with warmed arrowroot or ginger powder) ; mustard plaster to heart and hot bottles to extremities.

4. *Keep up respiration* artificially.

P. M. Appearances : Those of death from asphyxia. Gastro-intestinal mucous membrane, liver, kidneys, spleen, brain and lungs—congested.

Medico-legal points :

1. Aboriginal Indian tribes and hill-men use aconite as **arrow-poison**, or as **cattle-poison**.

2. Most cases of aconite poisoning are **homicidal**. **Accidental** poisoning occurs from its use (i) in overdose by indigenous practitioners in acute fever, rheumatism, cholera, and leprosy or as a love-philtre ; (ii) as an adulterant of country-made liquors (with a view to increasing their intoxicating property) ; (iii) from over-use of "*neuraline*," "*nervine*" and other patent applications, containing aconitine, for *cure of neuralgia* ; (iv) from *inhaling dust of root*, while powdering it. [Swallowing *ABC liniment* is less dangerous, because belladonna counteracts to some extent, the effects of aconite.]

3. **Destructibility**.—Opinions vary as to the effect of decomposition of body on the aconitine present in the corpse ; some hold that it is discoverable after short period of burial, others denying it.

4. **Diagnosis**.—The *tingling* of limbs in aconite poisoning may be differentiated from the cramps of cholera, by discovering in the latter, solid foeces in the intestines.

5. All parts of the plant are poisonous. Given with betel-pepper, the tingling caused by chewing the root is not felt.

6. Veratrine, aspidospermine, quebrechine (aspidospermine quebracho), lobelia and tobacco,—**resemble**, to some extent, the action of aconitine.

7. Aconitine is rapidly **decomposed** by alkalies (*e. g.*, ash &c). To arrest such decomposition, add a little alcohol and acetic acid. As minute quantity of Aconitine is fatal, **detection** of it in the viscera is not often possible, specially as, there are **little reliable tests**.

Detection by Stas' process. **Tests** : (1)+picric acid, bromine water or gold chloride=yellow ppt. (2)+Mayer's reagent=white ppt. (3)+Fehling's solution or Fe_2Cl_6 =no change (4) Physiological test—of tingling followed by numbness of part applied to.

DIGITALIS, Foxglove.

Leaves of *Digitalis Purpurea*, **N. O.** Scrofulariaceæ.

Similar actions of : Antiarin, Apocyanin, Erythrophleine, Etonymine, Saponin, Strophanthin.

Toxicity :—All parts of the plant are poisonous. *Digitonin*—depresses heart-muscles, being antagonistic in action to the following three. *Digitalein*—is non-cumulative. This is the chief constituent of soluble digitaline. *Digitalin*—possesses in a high degree the medicinal action of digitalis. *Digitoxin*—is 5 to 10 times more toxic than other active principles of digitalis, but uncertain, cumulative and dangerously irritant. *Digitin*—is physiologically inert. [*Toxiresin* (from digitoxin+acid+heat) and *Digitaliresin* (from digitalin+acid+heat) are dangerous convulsants, like picrotoxin] *Seeds*—10 times more toxic than leaves. *Commercial Digitalin* is a mixture of alkaloids—digitoxin from 6 to 10 times more being present in Nativelle's than in Homolle's.

Preparations : *Infusum* (1 : 146) 2 to 4 dr. ; *Conc. Infusum* (8 times stronger than simple inf.) 15 to 30 m. *Pil. hydrarg. et digitalis co.* (1 : 5), *Succus* 5 to 10 m ; *Homolle Amorphous digitalin* (chiefly digitalin) $\frac{1}{60}$ to $\frac{1}{30}$ gr. *Nativelle crystallized digitalin* (chiefly digitoxin) $\frac{1}{250}$ to $\frac{1}{100}$ gr ; *German digitalin.* $\frac{1}{60}$ to $\frac{1}{30}$ gr. *Pure digitalin,* $\frac{1}{250}$ to $\frac{1}{100}$ gr ; *Digitoxin,* gr. $\frac{1}{250}$ to $\frac{1}{60}$. *Pulv. folia,* gr. $\frac{1}{2}$ —1½, *Tinct.,* 5—15m. *Digalen, m.* 5—15 m.

Fatal dose : (a) *Digitalein*—gr. 1. (b) *Digitoxin*—gr. $\frac{1}{18}$. (c) *Digitalin,* $\frac{1}{4}$ — $\frac{1}{2}$ [= $\frac{1}{2}$ to 1 dr. folia.] (d) *Leaves*—over 38 gr. [8 gr. = $\frac{1}{16}$ gr. digitalin.] (e) *Tincture*—1½ dram to 6 drams. (f) *Infusion*—2 oz. [The maximum safe doses are : digitaline 0.03 gr. ; folia, 4½ gr. ; infusion, 1 oz. ; tincture, m. 45]

Fatal period : 24 hours or later. **Onset**, after 4—5 hours.

Symptoms [by whatever channel absorbed] :—

1. **Gastro-intestinal** : *Vomiting* (violent, repeated and frequently grass-green in colour) of mucus and bile ; *salivation*, thirst, gripes, colic and *diarrhœa*.

2. **Congestive** : Pain in back and limbs, *headache* ; giddiness. Drowsiness, hallucinations, delirium. *Eyes* are prominent, sclerotic looking blue. *Pupils*—fixed and dilated ; *vision* disturbed (haziness, chromatic dispersions, vibrations). Noises in the *ears*.

3. **Fall of blood-pressure** : *Pulse*—in horizontal posture, is full, strong, slow ; on patient's rising, becomes rapid, small and irregular : tendency to syncope. *Respiration*—slowed and sighing, inspiration being prolonged ; it then fails. After temporary rise of *temperature*, *skin* becomes cold and pale and patient is *collapsed*. *Urine*—suppressed.

4. *Mind* clear. Convulsions (asphyxial), coma and delirium supervening in some cases at last.

5. *Uterine* contractions, if gravid.

Prognosis.—*Sudden death from patient sitting or standing up,—within several days of disappearance of acute symptoms.*

Treatment : [Maintain recumbent posture for several days].

1. *Evacuate* by emetics (mustard or apomorphine with strychnine) or tube ; and by **purgative**.

2. *Neutralize it in situ*—by **tannin**. *Check nausea*—by ice, or sinapism over præcordia.

3. *Stimulate* by :—**strychnine**, nitroglycerine, **atropine**, camphor, coffee, alcohol, **warmth**, mustard plaster to heart.

4. Cautiously try opium, aconite—m 5 [*Digitalis* is useful in aconite poisoning, but not always vice versa.]

Separated by Stas' process. Tests. (1) + HCl + heat = green colour. (2) + HNO₃ = deep orange-red solution. (3) + H₂SO₄ + Br. = red colour, becoming emerald-green (4) **Physiological test on frogs by watching the heart-beats.**

TOBACCO, NICOTINE.

Tamaku, tamrakoot, tambakhu, tambak, Puka-yila.

Dried leaves of *Nicotiana Tabacum*, **N. O.** Solanaceæ.

Similar action of :—*Lobelia* (*Deonal, Bokenal, Dharal*)
Piturie (*Duboisia Hopwoodii*).

Fatal Dose : (a) *Powdered tobacco leaf*—1 dram. (b) *Powdered lobelia leaf*.—1 dram. (c) *Decoction* of leaves— $\frac{1}{2}$ dr. as enema. (d) *Nicotine*—1 to 3 drops.

Fatal Period : (a) *Tobacco*—1 hour. (b) *Lobelia*—1 day.
(c) *Nicotine*—3 minutes.

Symptoms :

GASTRO-INTESTINAL : Nausea, vomiting, purging, gripes.

COLLAPSE : cold, clammy skin and sweats ; *Pulse*—feeble and irregular ; *Respiration*—rapid and laboured, then slow and sighing.

CEREBRO-SPINAL : *Pupils*—contracted ; later, dilated. Giddiness, *insensibility*. *Muscular* tremors followed by their relaxation, *Convulsions* in some cases. *Sphincters* are relaxed.

Treatment : [*Maintain recumbent posture.*]

1. *Evacuate* (if swallowed)—by tube or emetics.
2. *Neutralize locally by*—tannic acid ($\frac{1}{2}$ dram).
3. *Stimulate* : strychnine (gr. $\frac{1}{80}$) &c. ; artificial respiration.

P. M. Appearances : None characteristic. *Gastro-intestinal* congestion. *Blood*—dark, treacly fluid.

Medico-legal points.

1. Cheap liquors of brothels are often adulterated with tobacco, to facilitate robbery.

2. Tobacco contains 2 to 8% of oily alkaloid, Nicotine ; also, Pyridine, Picoline (both causing amblyopia)

3. Cases of poisoning are chiefly **accidental** from :—
 (a) retention of *enema* given for killing worms ; (b) swallowing *juice* that collects in cigar-pipes (pyridine bases ?) ; (c) *endermic* absorption from leaves applied to unbroken skin, specially to swollen parts, hydrocele, &c. ; (d) *swallowing* leaves with betel.

4. **Modes of Using** :—In India, tobacco is **SMOKED**, ('*chillum*') ; **CHEWED** with pan (betel), either as dry powdered leaf (*dokta*) or as 'soorti'-pills ; or constantly kept in mouth by people of Upper India as *khaini* or *sookhá* ; and used as **SNUFF**. It is used also as an endermic application to scrotal tumours, hydroceles &c.

5. Excessive tobacco habit may end in **sudden death**.

Separated by Stas' process. **Tests** : (1) Strongly alkaline, oily liquid, which burns with yellow flame and smoke. (2) + platinic chloride = yellow ppt. (3) + Hg_2Cl_2 = white crystalline ppt.

ABRUS PRECATORIUS.

Prayer beads, Indian liquorice, Jumble beads, Jequirity seeds, *Ghunchi*, *Gunja*, *Kunch*, *Ratiphal*, *Karin*, *Runja*, *Ghunghachi*, *Chiramity*, *Chanotirati*, *Gulangunjey*, *Gulubindey*, *Chas-mekkh-rush*. **N. O.**, Leguminosæ. The **active principle** is *Abrin*, allied in chemical nature and action, to snake venom.

F. dose for cattle—gr. $1\frac{1}{2}$. **Fatal Period** : 18 to 48 hours.

Uses :—(1) **Taken internally**, it is harmless; provided the seed has been (a) boiled, (b) very old or (c) has been long decorticated. (2) It may be used to **kill men** in the dark : under the ruse of snake-bite, the 'sui' may be driven home. But, of course, the discovery of the broken end, of a single puncture and suppurative cellulitis clears the diagnosis. (3) It is used as follows as **cattle poison** :—The decorticated seeds, well powdered and mixed with gum, flour and water, are formed into sharp cones ('sui'), about $\frac{1}{4}$ inch or more long. As this poison is

introduced into the blood, by pricking and breaking off the point in the wound, producing violent spreading, suppurative cellulitis, hæmorrhagic lesions, cardiac and muscular depression, drowsiness, collapse and death, *this is known as 'sui or 'sutari' poison.*

Treatment : Draw out the sui, exhibit *stimulant* and give *pilocarpine* hypodermically.

SNAKE POISONING, * Ophitoxæmia (-dismus)

Fatal dose—15 to 17.5 milligrammes (for a person weighing 60—70 kilogrammes). **Fatal Period** (if given intravenously), less than a minute ; otherwise, $\frac{1}{2}$ to 2 hours. [A mgm. = 0.0154 gr ; 1 kgm = 2.2046 lb].

Notes about the poison.

1. **Families of poisonous snakes common in India are two, viz.,** (a) COLUBRINE : Cobra (*Naja tripudians*), *Keutid, Nág, Kíl-samf* ; King Cobra, (*Naja bungarus*) *Sankha-choor, hamadryad* ; Common Krait (*Bungarus cœruleus*) ; Banded Krait, *Raj* or *Sankhina samf*, (*B. fasciatus*) ; Sea-snakes (*hydrophinae*) (b) VIPERS : Russell's, or Chain Viper (*Vipera Russellii*) ; *Echis carinata Daboia, Bora, Phoorsa.*

2. **Distinction :** The non-poisonous snakes possess *two and complete* rows of small, *ungrooved* teeth, on either side of upper jaw—the OUTER row (of 20—24 teeth) being attached to the maxillary bones, the inner to the palatine. In poisonous snakes, in the OUTER row, there are *only one or two* (the anterior being *larger*) tubular (*grooved*), freely erectile fangs, which are firmly ankylosed to the maxillary bones. There are several smaller reserved fangs lying in proximity.

3. **Source of poison :** it is a viscid, homogeneous, liquid secretion of the racemose glands (homologue of parotid gland).

4. **Poison apparatus :** The racemose GLAND, one on either side, is situated behind the eye. Its DUCT, which begins as a *receptacle* (that runs the whole length of the gland) opens by a small Papilla not into, but at the base of, the fang. The POISON-TOOTH

is a functional tube, which opens on the anterior surface of the fang, near the tip. It is so arranged that no leakage occurs and that the venom is discharged at the moment the fangs penetrate the skin. The fang can be *erected* and *depressed* and when lost is replaced.

5. **Quantity** (dry solid) yielded by—(a) *Cobra* (of average 1 lb weight) - 200 to 370 milligrammes or over 13 grains of liquid (= 5 gr. solid), sufficient to kill eight men ; (b) *Daboia*—150 to 250 mg. (c) *Sea Snake*—9.4 to 2.3 mg. [The *blood* of the cobra is also lethal.]

6. **Nature of the poison** : The poison consists of a COAGULABLE and a NON-COAGULABLE proteids, the proportion of each varying with the different classes of snakes. The *cobra* poison is rich in the non-coagulable and *rattle snake* in the coagulable proteids. The non-coagulable proteid acts chiefly on the nerve centres, paralyzing the medullary respiratory centre ; and the coagulable proteid acts chiefly on blood-vessels and heart, being a powerful local irritant. **Chemico-biologically**, snake-poison = albumins (proteoses) containing a *fibrin-ferment*, an *anti-fibrin-ferment*, a *proteolytic ferment*, various *cytolysins*, *agglutinin*, an *anti-bactericidal* body (anti-complements), *neurotoxins* (if Colubrine, acting on phrenic, if viperine, on vasomotor and respiratory centre), a *cardiac and vascular tonic substance*. There are at least 3 **kinds** of poisons (a) Colubrine, (b) Viperine, (c) a mixture of the two. Symptoms differ in each case, according to the proportion of coagulable to non-coagulable proteids. Viperine venom is **destroyed** at 85°C and colubrine at 125°C and both become less toxic when exposed to air. Both can be preserved for years, fully lethal. **Physical Appearances** : *when fresh*, snake poison is a syrupy fluid, bitter, faintly yellow, transparent ; *when dried*, it is yellowish brown ; *when decomposed*, dark brown.

7. **The bite** : When a snake bites, the poison is deposited not in the skin itself, but in the *areolar* tissue beneath, and, as the skin is freely moveable, the part below the fangs, may have it *dragged away* from its proper position, before the poison is injected. As a rule, the snake's mouth being too small, it cannot make its

jaws meet tooth to tooth on the flesh ; it fastens itself obliquely and the *teeth may slip off* and tear the skin.

8. **Bite not invariably poisonous**—(a) owing to enough venom not entering the system by the bite ; (b) having delivered the poison else-where before, a snake becomes harmless for some short time.

9. **Eating Venom.**—Snake poison is transmissible through the *breast-milk* and *blood* of the victim ; but an animal *dead* from snake-poisoning can be eaten safely. Provided there are no cracks inside the mouth, *Saliva*, *Bile* and *Pancreatic* juice rob the colubrine venom of its terrors ; but viperine venom causes gastro intestinal hæmorrhage and death, without the appearance of usual symptoms.

10. **Mucous surfaces.**—Snake poison may be absorbed by healthy mucous membrane, as when put on the *tongue* or *conjunctiva*, where it also causes inflammation of them.

11. **Toxicity.**—The rapidity with which venom acts depends on (a) the *quantity* injected, (b) rapidity of *absorption* (intravenous, subcutaneous, etc), (c) *condition of the snake* at time of bite (exhausted or not) and (N) *susceptibility* of the individual. The larger the size of the individual, the more resistant he is to the dose of the poison. The minimal lethal dose (**M.L.D.**) for average man is 0.015 gramme of Cobra Venom.

12. **"Bish Boree"** or poison pill of ayurveda (a capital stimulant) contains white arsenic, sulphuret of arsenic, sulphur, mercury, croton seed, traces of snake-poison and musk.

13. **Diagnosis of poisonous snake bite :** (1) Non-poisonous snake bite gives impression of four rows of fine teeth ; poisonous ones give *two rows* of fine teeth, outside of which are two prominent impressions. (2) The part bitten begins to *smart* increasingly, to *swell* and to exude sanaceous fluid.

Test : Inject the substance into an animal, watch symptoms. Inject anti-venene and watch results.

Symptoms of Snake Poisoning :—

	Colubrine.	Viperine.
Onset	Within 15 minutes	Within 15 minutes ; or, intermittently after several hours.
Locally	Two fang marks, $\frac{3}{4}$ " apart. Oedema, redness, stinging, burning pain.	Two fang marks, $\frac{3}{4}$ " apart. Oedema, <i>ecchymosis</i> (suppuration, sloughing) burning pain ; <i>oozing of fluid</i> .
Nervous system	<i>Chiefly acted upon</i> : Feels weak, intoxicated, sleepy. Paralysis commencing in legs (\therefore inco-ordinated gait) becomes general, affecting specially— <i>tongue, lips, larynx</i> (\therefore choking sensation in throat and inability to swallow) ; profuse <i>salivation</i> .	<i>Not primarily acted upon</i> . There may not be general paralysis—nor any special involvement of tongue, lips, larynx ; no salivation. <i>Convulsions</i> occur early in the case.
Respiration	<i>Markedly affected</i> : it is normal for 15 minutes then quick, finally slow, and ceases before heart does so. <i>Nausea</i> and <i>vomiting</i> are present.	Breathing first quickened, then slowed. [<i>Sudden, urgent dyspnœa</i> may occur from intra-vascular pulmonic clotting]. No vomiting.
Heart	It beats awhile after asphyxiation. [In some cases, sudden death from paralysis of cardiac ganglia].	
Vasomotor centre	<i>No special action</i> . Blood pressure may remain <i>high</i> , even during asphyxia.	Marked <i>fall</i> of blood pressure : collapse.
Blood changes	<i>Blood is abnormally fluid</i> (coagulability is <i>delayed</i>) ; red corpuscles are destroyed.	<i>Diminished</i> coagulability of blood (\therefore rapidly spreading œdema, <i>hæmorrhages</i> into mucous surfaces, (e.g., bladder, intestines, mouth) and <i>ecchymoses</i> , (specially in chronic cases).
Other Symptoms	<i>Pupils</i> —contracted and react to light. <i>Urine</i> —not albuminous.	<i>Pupils</i> —dilated, insensitive to light. <i>Urine</i> —albuminous.

Colubrine.**Viperine.****Course and Prognosis**

Course—rapid (for good or evil), death within 30 minutes. Prognosis *better* with copious urination & cessation of nervous symptoms and *worse* with vomiting.

Course—treacherous. Prognosis—depends on course of blood poisoning.

Elimination : *via* (a) *Urine*, (b) *Saliva*, (c) *Breast milk*.

Treatment : [Give no alcohol, if antivenene is used.]

1. **Stimulate** by *ammon. carb.*, *strychnine* (gr. $\frac{1}{10}$ to $\frac{1}{4}$) or *musk*, to the extent of producing their full physiological effect ; friction ; warmth, quiet rest, *but keep awake*.

2. **Keep alive**—by *artificial respiration*, persistently given ; by cold affusion to head ; by *pituitrin* or *adrenalin* and by *binding* extremities and abdomen (to conserve blood into heart.)

3. **To prevent absorption** :—(a) Apply one or more tight *ligatures*, a few inches apart, on the proximal side of the wound ; be sure not to cut into or abrade the flesh or else more poison may be rapidly absorbed therefrom ; to loosen them for 2 or 3 seconds, after intravenous antivenene has been applied ; and to keep them on at least 30 minutes. (b) *Cut into the cellular tissue*—at the bottom of wound, incise along track of wound, *extend* it along veins and lymphatics and *excise* the skin-area. (c) Neutralize by *strong* (3%) solution or crystals of *pot. permanganate*, followed by *hot compress* or solutions of *platinic* or *auric chloride* (15 cc. of 1% to 5% solution) or *calcium hypochlorite* (1 in 10) or of *liq. potassæ*.

4. **Neutralize it physiologically**—by (a) giving Calmette's antivenene *intravenously*, 400 cc. ; or, *subcutaneously*, 400 cc., according to severity of symptom ; or, (b) the Kasauli polyvalent antivenene, 800 cc. *intravenously*. [Calmette's = mixture of snake

venoms, in which cobra poison greatly preponderates. Kasauli = mixture only of cobra and daboia poisons. One cc. of any of these, neutralizes 1 mg of dried venom. Antivenene keeps well even at 140° F.] or, (c) Inject intravenously,—350 cc. *Pot. Permanganate* solution (5%) ; or (d) *Adrenalin* and *calcium chloride*, if coagulability of blood is lost.

[REMARKS : (1) *Ligature* is temporarily useful, if applied within 10 minutes of bite and if the limb contains only one bone and if antivenene is injected within 20 minutes. (2) *Local destruction* by *pot. permang.* is absolutely unreliable. (3) *Antivenene* injected subcutaneously can be useful in 3½ hours ; but, if used intravenously, within 1½ hours : hence, always prefer the latter route].

P. M. Appearances :—*Body putrefies rapidly. Locally*—purplish clots at site of puncture, blue discoloration of local areolar tissue, swelling, effusion of blue blood under skin, exudation of oily fluid on squeezing.

COLUBRINE : *R. M.* well marked, while *blood* is still fluid. *Parotids* are swollen. *Brain* normal, *pia mater* injected. *Lungs* and *bronchi* congested. *Right heart* is full. *Liver* congested ; *Kidneys* normal or congested and both show fatty degeneration. *Bladder* contracted.

VIPERINE :—(1) Fluid condition of *blood*. (2) Vasodilatation of *portal system*.

BITES & STINGS.

Symptoms :

The bites (1) of LION, TIGER, LEOPARD—are very prone to become *septic*, as these animals are carrion-feeders ; (2) the bites of WOLF, JACKAL and DOG are liable to lead to *hydrophobia*. Biting, mauling or goring—results, generally, in *collapse* from profuse hæmorrhage or shock.

Stings of SCORPIONS and bites of SPIDERS or certain FISHES have been known to kill *children*; and, in *adults*, elevated temperature, or collapse, tremors, cramps, convulsion, typhoid condition or delirium, dyspnoea, rigors, bloody vomit, local hæmorrhages &c. Death is rare in adults and seldom occurs before some days.

Multiple stings of WASPS, BEES and HORNETS may be fatal to adults, but single ones are not fatal, unless they happen to have penetrated into a vein or the respiratory tract. SALAMANDRINE (from skin glands of various amphibians) causes vomiting, salivation, dyspnoea, convulsion, dilated pupils, diaphoresis. PHRYNINE (from skin of toad) is a cardiac depressant.

Treatment.

Of Bites :—(1) Wash well with *permanganate* solution, followed by *iodine* lotions. (2) Remove foreign bodies. (3) Treat symptomatically.

Of Sting :—

LOCALLY.—(a) *Extract* the sting. (b) *Apply*—alkalies (ammonia, lime), raw onion, ipecacuanha, salt solution, tinct. iodi, carbolic lotion (1 dr. to 8 oz), chloroform, cocaine (gr. 16 to 1 oz). menthol-camphor, ice, calcium hypochlorite (1 : 60).

GENERALLY :—*Stimulate*, if collapsed; morphia, if in pain; steam inhalation and tracheotomy, if suffocated.

Diagnosis.—*Scorpion* leaves one puncture; *Centipede* makes two punctures, which disappear soon after the bite; *Spider* bite causes local hæmorrhage and swelling.

ARROW POISON.

Nature : It may be an *animal* poison (e.g., snake-venom, crushed beetle, centipede, scorpion or spider or micro-organism growing on dead creatures) or *vegetable* (e.g., aconite, strychnine, strophanthin, curare, digitalis &c.) or *mineral* (arsenic, etc.)

Symptoms (besides *local* ones)—are those referable to *heart* or *muscles* or *peripheral nerve-endings* or *nervous system* &c.

Treatment : (1) **Prevent absorption**—by tying a firm *ligature* on proximal (heart) side. (2) **Remove the arrow quickly**—by enlarging the wound and passing down a canula over the barbed head and *withdrawing* the arrow, whole, through this canula ; or, by cutting down on the point of the arrow and extracting the broken barbed head through the new skin-cut and the broken shaft through the wound of its own making. (3) **Locally**—wash with 3% *pot. permanganate* solution, followed by *warm iodine lotion* ; or by sucking (*cupping*) **Stimulate heart**. (5) **Antitetanic serum** may be given.

SANTONIN, WORMSEED.

Santonin is a glucoside from unexpanded flower-heads of *Artemisia Maritima*, N. O., Compositæ.

Similar Action of :—(1) **Wormseed** or *Chenopodium, Mastaru, Nagdoni, Machiparna, Surpana, Moshe-patre, Kirmani owa* (2) **Wormwood**, *Artemisia absinthum*. (3) **Tansy**, *Tanacetum Vulgare*.

Fatal dose : (1) **Santonin**—2 grains killed a child 5½ years. [*Medicinal dose* (adult) = 2 to 5 gr ; for a child 1 year old = ½ to ⅓ gr.] (2) **Wormseed oil**—10 drops (child 3 years)

Symptoms :

Gastro-intestinal irritation : pain, vomiting. **Collapse**—pallor or cyanosis, profuse sweat, coldness of body.

Cerebro-spinal :—*Headache, giddiness, trembling ; ringing in the ears, a species of intoxication, convulsions* (sometimes, stupor), coma, tendency to asphyxia.

Visual disturbances : objects appear at first blue, then yellow (xanthopsia), followed by colour-blindness. *Pupils*—contracted.

Urine—increased and, if it is acid, is saffron-yellow coloured ; if alkaline, purplish red.

Treatment :

1. *Evacuate*—by pump or emetics (mustard &c.)
2. *Treat symptomatically* : (a) if collapsed, give stimulants ; (b) if convulsed, give chloral and bromide.

Separation—in slightly alkaline water by shaking up with chloroform.

Tests : (1) $+H_2SO_4 + \text{heat} = \text{yellow colour}$. This when cold $+ \text{ferric chloride} + \text{heat} = \text{blue or reddish-violet colour}$ [(2) Urine containing it $+ NaOH = \text{red colour}$. This $+ \text{milk of lime \& filter} = \text{colour persists (vs. Rhubarb)}$].

Clinical points :

It exists 2% in *seed*, $2\frac{1}{2}\%$ in *oil* and 3% in the *resin*.

Being insoluble, it is safer when given as such rather than as soluble sodium santoninate or santonine dissolved in castor oil, both of which are dangerous.

It is best given in $\frac{1}{2}$ grain doses repeatedly. For young infants, it is hardly a safe remedy in any efficient dose : worms have been expelled but patients brought near death's door or blinded for months.

NAPHTHALENE OR NAPHTHALIN.

Albastrine, Camphylene, Albocarbon, Moth-destroyer.

Symptoms [Cp. Alcoholism].

1. Restlessness, delirium, coma. Muscular spasm. *Gait* ataxic.
2. *Respiration*—laboured, irregular : lips and face cyanosed. *Temperature*—reduced. *Pulse*—quickened.
3. *Urine*—dark-brown coloured, passed with strangury.

Treatment : Evacuate. Stimulate. Secure diuresis.

Fatal dose. and period are unknown ; a 1% solution used as vaginal douche after delivery, caused death on the 10th day.

NITRITES.

(1) **Amyl** nitrite, Itrosyl, Tertiary amyl nitrite. [Bertoni's ether = amyl nitrite + isobutyl nitrite]. (2) **Ethyl** Nitrite (spt. ætheris nitrosi). (3) **Sodium** nitrite. (4) **Glyceryl** Nitrite. (=nitroglycerin or Nobel's blasting oil, Glonoin or Trinitrin), *F. Dose* = 1 ounce. (5) Erythrol tetranitrate, Mannitol, Cordite, Roburite, Lyddite. *All these last ones are extremely explosive.*

Symptoms* :

Blood pressure and Heart :—Arterial pressure—suddenly falls. *Heart beats*—forcible, frequent. *Pulse*—full and hard : *painful pulsations* all over body, severe *throbbing of head* and intense *headache* and *giddiness*.

Motion and *reflexes* become paralysed. *Temperature* falls. *Nausea* and *vomiting*.

Respiration tends to be paralysed : hence, lividity, sweating unconsciousness.

Treatment :

[*Maintain recumbent posture.*]

1. *Evacuate* by emetics, (apomorphine) or tube
2. *Maintain respiration* artificially or by fresh air, *Oxygen*.
3. *Stimulate*—specially by hypodermic strychnine, digitalis, ergotine (gr. i.) or **adrenalin** solution.
4. *For headache*—give belladonna.

Chemical Notes.—(1) **NITROGLYCERINE** (oily liquid) is the most powerful member of this group, and, like amyl nitrite, is the most rapid in action. Mixed with Kieselguhr, it forms **DYNAMITE**. (2) **ROBURITE** = di-nitro-benzene + chloro-nitro-benzene + ammonium

* These are symptoms of **SWALLOWING** the poison. As a rule, poisoning occurs more frequently from **INHALATION**, in miners, after an explosive cartridge is fired in the pit. They suffer from—severe headache, collapse, a sense of nervousness, muscular tremor, alternate flushing and paling of the face, followed by vomiting, which often brings relief. Most of these *explosives produce enormous amount of CO, CO₂, nitrous fumes.* *Treatment* (when inhaled) : fresh air, oxygen inhalation, artificial respiration.

nitrate. (3) **CORDITE**=nitroglycerine 58 parts+gun-cotton 37 + mineral jelly 5 + acetone. Each Lee-Metford cartridge contains 60 cylindrical strands of cordite, each strand measuring $\frac{1}{4}'' \times \frac{1}{25}''$ (4) **ERYTHROL TETRANITRATE**=tetra-nitrin (5) **MANNITOL**=hexa-nitrin (6) **AMYL NITRITE**—is a yellow liquid. In strong doses, the liquid causes erosion of the gastric mucous membrane.

OLEANDER. (N. O. Apocyanaceæ).

Varieties :—(1) **Nerium odorum**. True or Sweet-scented oleander, *Sweet-Karabi*, *Safed kaner*, *Kanel*, *Alari*, *Ganneru*, *Bakanlingey*, *Kanerchettoo*. (2) **Thevetia Neriifolia** or *Cerbera Thevetia*, the Exile, or bastard or yellow oleander. *Kalkey-phul*, *Chiney Karabi*, *Pila-kaner*, *Pachchai-alari*. (3) **Cerbera Odollam**, *Dabur*, *Pili Kirbir*, *Katarali*, *Sukanu*, *Honde*.

Indigenous Uses : For cure of *colic*, *fever*, *ringworm*, *chancres*, *syphilis*, *hydrophobia*, *baldness*, *heart-troubles*, *snake poisoning* and **Abused** to procure *abortion* or *suicide* or *homicide* or as *cattle poison*.

Fatal Dose :—(1) *Decoction*—1 oz. ; (2) *Seeds* (crushed)—8 to 10, for adult ; 1 for a child of 3 years (3) *Tincture* (1 : 5) over 2 drams. (4) *Karabin* and *Neriodorin*—gr. 5. (5) *Root*— $\frac{1}{2}$ oz.

Fatal period : 1 to 4 days.

Chemical Notes

(1) The *seeds* and *milky juice* of bark of *thetvetia neriifolia* are both poisonous, containing *thetvetin* which is both an acrid and a cardiac poison : hence, *local action is more marked*.

(2) The *roots*, *leaves*, *bark*, *flowers*—of *nerium odorum* are all poisonous. Active principles are : (a) *Neriodorin* and *Neriodorein* ; they act like digitalin ; and (b) **Karabin**, *Neriin*, which partakes of the dual actions of digitalin and strychnine. (c) **Thevetin**—a glucoside obtained from *C. Thetvetia*, and *C. Odollam*.

Symptoms : Vomiting, dysphagia, frothy salivation, abdominal pain, but no diarrhoea. Repeated attacks of (usually unilateral) clonic or tonic *convulsion*, lock-jaw and active delirium. *Insensibility*—only in some cases. Slight *fever*. *Pupils* dilated or unequal ; *eyes*—congested. *Pulse*—slow and small. *Breathing*—stertorous, rapid, collapse.

Treatment :— [Maintain recumbent posture.]

1. *Evacuate*—by emetics (apomorphine, mustard &c.)
2. *Stimulate* : Ammon. carb., ether, brandy (per rectum).
3. *Diuretics, demulcents, bromides.*
4. *Neutralize* (cautiously) by aconite, morphine.

Separation—by Stas' process. *Karabin* occurs in the acidulated ether extract and *Neriodorin* in the chloroform extract. [In case of *Thevetia neriifolia*, exhaust it with alcohol, filter, evaporate to dryness and wash residue with ether]

Tests : *Karabin* : (1) + H_2SO_4 conc. = light brown colour ; + Br or HNO_3 fumes = faint violet-brown colour. (2) + Fehling's solution + heat = no reduction. *Neriodorin* : (1) + H_2SO_4 conc. + KNO_3 = reddish-violet colour. (2) + Fehling's solution + heat = reduction. *Neriodorein* : (1) + Fehling's solution + heat = no reduction. (2) + HCl conc. + heat = no change. *Thevetin* : (1) + H_2SO_4 conc. + $\text{C}_2\text{H}_6\text{O}$ = play of colours—brown, crimson, deep-green. Put on tongue = tingling followed by numbness.

GELSEMIUM. Yellow Jasmine.

Root of *Gelsemium Nitidum* or *Sempervirens*, **N.O.**, Loganiaceæ. **Active principles**—Gelsemin, Gelseminine.

Fatal dose : (1) *Ext. liq.*—2 dr. (2) *Gelseminine*—gr $\frac{1}{8}$.

Fatal period : 7 $\frac{1}{2}$ hours. **Onset**—1 $\frac{1}{2}$ hours.

Symptoms (chiefly of Gelseminine)

Cardiac—depression ; *giddiness*. *Pulse*—feeble, thready, with fall of *blood-pressure* and *temperature*. *Skin*—bathed in cold sweat.

Respiration—laboured, slow, failing : *asphyxia*, convulsion, *coma*.

Spinal : *Sensibility*—gradually annulled. *Muscular* convulsions and trismus, then increasing weakness, going on to paralysis (jaw drops, *articulation* is imperfect, *gait* is staggering).

Ocular : (a) *Browache*, (b) *Diplopia*, partial or total *blindness*, internal *squint*—(c) *Pupils*—dilated (?) and fixed. (d) *Ptosis*.

Treatment :

1. *Evacuate* by emetics or tube.
2. *Neutralize* (a) locally by—charcoal or **tannin** ; (b) physiological action—by morphine (?)
3. *Stimulate heart*—by **atropine** (gr. $\frac{1}{80}$ hypodermically), with **strychnine** (gr. $\frac{1}{30}$) ; or, **Nitroglycerin**, etc.
4. *Stimulate respiration*—by artificial respiration, faradization of phrenic nerve, alternate hot and cold douche to head and chest.

Medico-legal points :

1. Quack remedies for cure of *fever* or *pain* may contain it ; and it is used also to procure *abortion*.
2. *Gelseminine* is a paralyzant and irritant, while *gelsemin* first convulses and then paralyzes spinal nerves.
3. Locally applied, gelsemium dilates the pupils ; taken internally, *it may contract them* [Ringer and Murrell].

Separated by acidulating with H_2SO_4 and shaking with CHCl_3 .

Tests : (1) $+\text{HNO}_3$ =reddish colour. $+\text{NH}_4\text{OH}$ in excess=blood-red colour (2) $+\text{KOH}$ =fluorescence (3) $+\text{H}_2\text{SO}_4 + \text{MnO}_2$ =red colour changing to green (vs. *Strychnine*).

COCCULUS INDICUS, PICROTOXIN.

Levant nut, *Kákmári*, *Kakphal*, *Karwi*, *Kakhay-kollivirai*.

Fruit or berry of *Anamirta Cocculus*, **N. O.**, *Menispermaceae*. **Active principles** : *Picrotoxin* (found in seed only), *Menispermine*, *Para-menispermine*.

F. dose (Picrotoxin) : 2 to 3 gr. **F. Period** : $\frac{1}{2}$ hour or more.

Symptoms :

1. *Gastro intestinal irritation* : vomiting, purging, gripes.
2. Convulsion (with opisthotonos and complete relaxation between spasms ; *wakeful lethargic stupor*. *Loss of voluntary power*, giddiness, delirium, and loss of acuity of vision. *Pupils* —contracted.

Treatment :

[*Maintain recumbent posture.*]

1. *Evacuate*. 2. *Neutralize*—by 30 gr. chloral for each $\frac{1}{10}$ gr. picrotoxin. Chloroform inhalation (if necessary)
3. *Stimulate*.

Medico-legal points :

1. As the pericarp of the seed is non-poisonous, an *entire seed* may be swallowed and pass out, without causing any symptoms of poisoning.

2. Toxi-resin and digitali-resin (obtained from digitalis) act like picrotoxin.

3. **Criminal Uses** (1) *To adulterate* ale, beer porter etc., —to increase their intoxicating qualities. (2) *As fish* or *cattle* poison (e. g., Barber's poisoned wheat). (3) *As parasiticide*. (4) *By robbers* to stupefy their victims or for committing rape.

Separate by Otto-Stas' process : Suspected liquid + HCl + ether = crystals of picrotoxin on evaporation.

Tests : (1) + HCl or HNO_3 = dissolved, without change of colour. (2) + H_2SO_4 = orange yellow colour. This + bichromate of potash = violet colour, passing into brown. *Physiological Test* on frog : restlessness, drowsiness, tetanic convulsions and swelling of abdomen.

CALABAR (ORDEAL) BEAN.

Seeds of *Physostigma Venenosum*, N. O. Leguminosae.

Active principles : *Eserine*, *Physostigmine* (both paralyzants) *Calabarine* (convulsant).

Fatal dose: *Beans*—6 in number. (Each seed = 97 grains.)
Eserine,—over gr. $\frac{1}{10}$.

Symptoms :

Gastro intestinal irritation : salivation, vomiting, colic, diarrhoea.

Heart—beats slowly but forcibly ; *blood pressure* is raised then both fail, with profuse sweating.

Respiration—tends to fail, causing asphyxia, with spasmodic contraction of bronchial tubes.

Cerebro—Spinal : *Muscles* get tremors, followed by weakness and paralysis. *Reflexes*—abolished, after brief excitation. *Sensibility*—diminished. All involuntary muscles are more or less stimulated. Narcotism is rarely found ;—usually, mind clear to the last. *Pupils*—contracted (whether locally applied or taken.) *Secretions*—actively increased.

Treatment : [Maintain recumbent posture.]

1. *Evacuate*—by emetics (if necessary).
2. *Neutralize locally*—by tannin : charcoal etc.
3. *Neutralize physiologically* by—**chloral** (gr. x. every 15 minutes) or **atropine** (gr. $\frac{1}{80}$ every 15 minutes, till pupils dilate or pulse is quickened or the hyper-secretion of bronchial mucous membrane is checked). (Pilocarpine ?) (Morphine ?)
4. *Stimulate* by **strychnine** and maintain artificial respiration.

Separation—by Stas' process with ether.

Tests : (1) + Br water = reddish-orange turbidity, clearing up on heating. (2) + Cl. water = red colour. (3) Physiological test on eye.

NOXIOUS GASES USED IN WARFARE.

Introduction.—Asphyxiating gases may be projected on a large scale on the enemy, either (a) by detonating bombs charged with suitable chemicals, or (b) by squirting the gases from special

apparatuses, when a favourable wind is blowing. Such gases must be heavier than air.

The possible gases : I. *Asphyxiating* : Nitrogen, Hydrogen, Sulphur dioxide, Chlorine, Phosgene, Bromine (vapourized), Tetroxide of nitrogen, Nitric peroxide, Chlorides of sulphur (See p. 261). II. *Poisonous* : Carbon monoxide, Hydrocyanic acid.

Symptoms : (1) Either, immediate death, from spasm of glottis ; or, acute œdema glottidis, producing, in the first stage, acute dyspnoea ; then a period of supreme exhaustion ; finally, a period of suffocative bronchitis.

Treatment : (1) *If much cyanosed*,—give 10 oz doses of sodium chloride solution or a weak emetic dose of copper sulphate, till frothy sputum is expectorated ; perform artificial respiration (preferably by Schafer's method).

(2) *For Bronchitis* : give Ammon. Carb. (10 to 15 gr.) with vln. Ipecac. (m 15) thrice a day. Later on, if secretion is very active, give Atropine. In all stages, give oxygen and Tinct. Benzoin Co. inhalation, hot blankets and pituitrin injection, as may be necessary. In cases of extreme restlessness, try Tinct. opii, m 5.

CHAPTER IX.

INFANTICIDE.

Definition .—Infanticide is the murder of a living infant *during* or *after* its birth. Lawfully, it is homicide—no matter, whether from the effects of injuries inflicted during or after *complete birth*. [Destruction of a foetus *before* commencement of labour is called **foeticide**. See under "Abortion."]

Difficulties .—Though infanticide is murder, ordinary provisions of law and ordinary evidence do not cover the ground ; hence, special evidence on certain points is called for. These special points are, briefly, these :—

(A) **Legal** :—(1) Law assumes that *every* child is born dead ; hence, *live-birth* has to be *proved*. (2) Law gives preference to statements of *eye witnesses* over dogmatic *opinions* of medical men.

(3) *English* Law construes it as "live birth" when an infant is completely born and apart from the mother—it is immaterial whether it is attached by cord or not. (4) *Indian* Law construes "live birth" as the birth of *any* part of the living child, even though the rest be not born for considerable time afterwards. Killing an infant while it is inside uterus, is not homicide (I. P. C. §§ 299, 315).

(B) **Medical** :—

(I) BREATHING IS NOT EQUIVALENT TO LIFE : (a) A child may be *seen* to have breathed, but, post mortem, *no air* may be found in lungs. (b) A child may be *born alive*, but *may not breathe*, owing to birth in caul, to suspended animation, &c.

(II) At the time of delivery, FATAL INJURY to body of child, may occur from such *natural* causes as—(1) *precipitate labour*, (2) *artificial delivery*—(a) by *skilled* hands, or, (b) by *unskilled* hands, or from (3) *still birth*. These may lead to *wrong inferences of foul play*.

(III) FALLACIOUS INFERENCE may also be drawn as to cause of death, (1) when a child is *scientifically murdered*, it being looked upon as a case of *natural* death ; or (2) when certain *natural signs* of puzzling character exist on the child's neck, *foul play* being wrongly assumed.

Causes : (1) ILLEGITIMACY (2) CUSTOM : *viz.*, (a) sacrificing a child to propitiate a deity, or (b) to pander to family pride ; (3) POVERTY and (4) To get ENEMY into trouble.

Modes of killing :—1. Throttling. 2. Strangling by string or navel-cord. 3. Suffocating it (a) under *bed clothes*, by overlaying it ; (b) by closing its mouth and nostrils, by

hands or by drawing over them the foetal membranes ; (c) by holding down child's face in its own *discharges*, cowdung, milk, ashes, bran or other media ; (d) by shoving fingers, *pellets* of linen, tow, stones, dough, bran, ashes, mud, &c., down its throat ; (e) by *rolling the tongue back* into its throat ; (f) by *burying* it in a pot ; or (g) by exposing to noxious gases (SO₂, CHCl₃, etc.) [An infant may, on the other hand, vomit curdled milk and be killed by aspirating the vomit accidentally into its wind pipe] 4. **Hanging** it from a tree. 5. **Wounds** :—(a) *Fracturing* its skull. (b) *Twisting* the neck. (c) *Puncturing* its brain or spinal cord or heart, while still in utero or after its birth. (d) *Cutting* the throat. 6. By acts of **omission** e. g., (a) Not tying the *umbilical cord*, after dividing it. (b) *Starving* the child relatively or absolutely. (c) Exposing it in *jungles* to wild animals. (d) Exposing it to *cold*. 7. **Poisoning** with—akanda, arsenic, cathartics, chloroform, dhatura, opium, phosphorus (match stick head) or tobacco;

Post Mortem Examination :—Besides all the ordinary points, (See p. 36) ascertain—

I. Its Age and Viability (developmental progress), e. g.,

- (1) WEIGHT, LENGTH and exact middle of BODY.
- (2) Weight of PLACENTA. [In a child at full-term it is $=\frac{1}{6}$ or $\frac{1}{8}$ of body weight].
- (3) Centres of OSSIFICATION present.—See p. 43.
- (4) GROWTH of nails, hair, etc. and DISAPPEARANCE of lanugo, vernix caseosa, pupillary membrane &c.

II. Its identity and Paternity—See chap. on 'Illegitimacy'.

III. If the child was born alive.—It was so, if, at death—

- (a) The child reached the *viable period* ;
- (b) The signs of *live-birth* were present collectively.

(c) Ante-partum *rigor mortis* was absent [Presence of *post partum rigor mortis* does not disprove live-birth] ; and

(d) Ante-partum *maceration* or *mummification* was absent.

[A child lying *inside* uterus, with membranes ruptured, will putrefy, the same as it would, if *outside* uterus].

IV. If the child was nursed and attended to.—Conditions of *cord* (length, tied or not, tied at what distance from navel), of *skin*, *throat* and *stomach* (feeding)—answer this.

V. Cause of death :—Was it a case of precipitate labour ? or, of still-birth ? or, of artificial delivery ? Examine fontanelles, orifices &c. carefully. (See p. 130 para. 3.)

VI. Length of time the child was alive.—See "Period of Survival", below. (p. 329).

VII. Length of time it has been dead—by the help of the putrefaction time-table. [See Appendix.]

Examination of the alleged Mother—should be done, if she is forthcoming. In her, look for (a) *signs of recent delivery*, (b) for presence or absence of *puerperal insanity*, (c) her *mental powers and equilibrium*—i.e., if she had the power to judge properly, during the agonies of labour pains and amidst her shame and fear, as to what she was doing.

Signs of Live Birth* :—Ten in number, *viz.*,—

I. Signs of Respiration in Lungs [Contrasted with those found in lungs that have *not* breathed] :—

*The most important Signs of live birth (a) ACCORDING TO LAW are : (1) Pulsation in *funis*, (2) Proof of action of muscles of *respiration* or *deglutition*, (3) *Lung tests*—any of which tends to prove that the child was carrying on its being completely external to, and without help of, its mother. (b) MEDICALLY, they are—signs of *respiration*. In the case of *Brock vs. Kelly* (Ap. 1861) it was held, that proof of respiration was not essential and that pulsation of *cord* was sufficient legal evidence of live birth.

*Before Respiration**After Respiration.*

VOLUME.—Lungs are very small; they are placed posteriorly inside thorax, where alone, they cover diaphragm.

Big thymus gland occupies upper and middle parts of chest; and the heart, the lower parts.

COLOUR: uniformly pale-brown (if seen soon after opening chest); posterior surface is blacker; lungs are not visible on opening chest.

SURFACE: dull in lustre, Air-cells are not discernible; any decomposition-gas, if present, can be easily moved.

CONSISTENCE: Solid, tough, inelastic; cut into, little blood and no air escapes. If putrid, big, uneven bubbles escape.

SP. GR. = 1.04. **HYDROSTATIC TESTS:** Both lungs, or, any one lung with heart attached, each lung separately, any portion of a lung, squeezed bits of lung—all sink in water.

AVERAGE WEIGHT = 874 gr.

PROPORTION TO BODY = 1 : 70.

Lungs large: completely fill thorax and overlap heart and pericardium; push diaphragm down and cover most of it.

Red or mottled (according to extent of breathing); lungs are completely visible on opening chest.

Transparent, mottled; inflated air cells project visibly above surface level, and can't be displaced by squeezing.

Spongy, \therefore elastic; cut into, air and blood escape. Crepitant on pressure; but all air cannot be squeezed out.

= .95. Both lungs or any one lung with heart attached, each lung separately, some portions of lungs, squeezed bits of lung—all float on water.

Weight = 1072 gr.

Proportion = 1 : 35.

II. Diaphragm Displacement: (a) In *non-respired* lungs, the dome of diaphragm will be at level of 3rd, 4th or 5th rib; (b) in *respired* lungs, the highest point of its arch is on a level with 5th, 6th or 7th rib (as ascertained from *abdominal* cavity,

before opening the thorax); (c) in *unnaturally expanded* lungs, the arch will be at still lower level.

III. Stomach and Intestines—contain (a) *air* (as tested by floating, en masse, ligatured oesophagus, stomach and duodenum; and (b) *food* or *blood*. [CAUTIONS: (a) Exclude putrefactive gases generated *after death*. (b) *As there is no air in child's alimentary tract, while it is in utero*, presence of air, like the presence of food, blood or meconium, proves living actions *at or during birth*, but does not prove live-birth. (c) Presence of foreign bodies, like *slop-pail-water* or *excrementitious matter* &c. inside stomach or air-passages (from falling into them or being held down there) prove live birth.]

IV. Intestines :—*Meconium* (usually voided within some hours to 3 days of birth) has probably been voided. [CAUTION: It may just as well be voided *before birth*].

V. Closure of—Foramen Ovale—between 2nd and 10th days; **Ductus Venosus**—between 3rd and 5th days; **Ductus Arteriosus**—by 10th day; **Hypogastric Artery** (internal part) by 2nd to 3rd day; **Umbilical Vein** (internal) by 3rd to 5th day.

VI. Middle Ear contains *air* (Wredin's test).

VII. Changes in the cut Umbilical stump :—

1. *Within 24 hours* : Clots formed in the vessels of cord.
2. *After 24 hours* : Mummification of arteries (by concentric thickening) near navel. [(a) If before mummification, child was thrown into water, liquefactive decomposition would be found instead. (b) Mummified navel-string can be made supple by soaking it in water.]
3. *About 2nd day*—Contraction occurs throughout umbilical arteries.

4. *About 3rd day*—(a) Constriction of the 'arteries' to their termination in the common iliacs. (b) Slight contraction of the umbilical 'veins'. (c) Dessication of the cord, formation of an inflammatory ring (=a vital sign) and a slight purulent discharge at point of its ultimate separation (=a vital sign too).

5. *About 4th—7th day* : it drops off, the umbilical vessels being obliterated (arteries earlier than veins).

6. *In 12 days*—cicatrization and *in 21 days*—healing.

VIII. Bladder—probably *empty*, urine having been voided at or after birth.

IX. Evidence of (a) Heart-beats (b) pulsation in umbilical cord and (c) Twitching and other muscular movements.—which prove at least life in those structures. [But convulsive movements of muscles of any part of the body may occur also in a really dead child.]

X. Skin changes—General peeling or scaling off. [But beware of confounding it with intra-uterine maceration.]

Appearances of a viable child (by intra-uterine age) :—

	6th month.	7th month.	8th month.	9th month.
<i>Length</i>	9—12 inches	13¼ to 15 in.	15 to 17 in.	19½ to 22"
<i>Weight</i>	23½ ounces	41½ ounces	3½ lb.	6—9 lb.
<i>Middle of body</i>	Lower end of sternum.	Nearer sternum.	Nearer navel	¾" na
<i>Skin</i>	Wrinkled, red. Papillae appearing.	.....	Smooth but face, wrinkled.	.....
<i>Subcutaneous Fat</i>	Hardly any.	Very slight.	Slight.	Plentiful.
<i>Lanugo</i>	Present all over body.	Disappearing from face, palms & soles.	Disappearing.	Present only on shoulders.
<i>Vernix Caseosa</i>	Covers all over	Covers all over.	Disappearing.	In back and at flexors.
<i>Eyebrows</i> <i>Eye lashes</i>	} Just formed	Eyelids open ; pupil memb. disappearing.	Eyelids open. Pupil. memb. disappeared.	Eyelids open.

Appearances of a viable child (by intra-uterine age) :—*Contd.*

	6th month.	7th month.	8th month.	9th month.
<i>Testicles</i>	Near kidneys	Near internal abd. ring.	Left one is in scrotum.	In scrotum (both)
<i>Ossification</i>	In 4 divisions of <i>Sternum</i> .	In <i>Astragalus</i> .	Last <i>Sacral</i> vertebra.	<i>Cuboid</i> , <i>Femur</i> (1" lower end)
<i>Hair</i>	.....	Dark ; found on scalp. $\frac{1}{4}$ " long.	.....	.....
<i>Finger-nails</i>	.....	Can be discerned.	To tips of fingers.	Extend beyond tips.
<i>Intestines</i>	Sacculi appearing ; meconium in upper part.	Caecum in right Iliac fossa. meco. present.	Contain meconium.	Meconium near rectum
<i>Toe-nails</i>	.....	.....	Don't extend to tip of toes.	Extend up to tip of toes.
<i>Poster. Fontanelle</i>	Open	Open	Open	Closed.

These are not absolutely dependable and give only a rough approximation to truth. A child may prematurely develop towards later months or vice versa.

Period of survival : Death has occurred *probably*—

Within 24 hours :—If *clotted* blood is found in *umbilical cord* ; if stomach contains frothy fluid ; if *meconium* has been discharged ; if umbilical cord shows blood clots. [CAUTION: In breech presentations, meconium may be voided during delivery, the child being still-born.]

Over 24 hours : If umbilical arteries at *navel* are mummified and *vernix caseosa* has disappeared.

Over 3 days : If umbilical arteries have *constricted* down to common iliacs, if *cord* is *dessicated* and inflammatory ring and slight purulent discharge have formed at point of ultimate separation of cord.

Between 4th to 7th day : Exfoliation of *skin* begins ; *cord* separates, *ductus venosus*, umbilical vein, hypogastric artery close.

8th—10th days : *Foramen ovale* and *ductus arteriosus* have closed.

12 days—if *cord* has cicatrized.

21 days—if navel has completely healed up.

Medico-legal points :—

1. **Evidence of birth of a foetus at "full-term"**—is derived from (1) its WEIGHT ; (2) its LENGTH ; (c) condition of its SKIN—which is plump and smooth (and not lax and wrinkled) ; (d) absence of LANUGO from all parts of the body, except, perhaps, the shoulders and cheek ; (e) EYE-BROWS and EYE-LASHES being well developed and HAIR OF HEAD, one inch long ; (f) both TESTICLES having descended into scrotum ; (g) CENTRES OF OSSIFICATION being found in lower *femoral* epiphyses, *astragalus* and *cuboid* ; (h) BREASTS being plump and yielding a drop of secretion, when squeezed ; and (i) its MOVING well and CRYING lustily. [CAUTIONS : (1) *Size* and *weight* are not absolute for any intra-uterine age, and do not depend on health or stature of parents. (2) If gestation is carried beyond an average term, foetal development does not proceed proportionately. All children do not develop equally or possess the same aptitude for living at the same uterine age. At 9th month, a normal child may be born very much exceeding the average weight and size. It is, after all, a question of advance of *development* and *growth*. But, according to Taylor, "Children born at the full period vary considerably in size and weight ; yet, although small, there are commonly about them, the appearances of complete development. This is specially apparent in the features. If there is a *general* want of development of the body and if certain *foetal peculiarities* remain (e. g., the pupillary membranes and if male, the testes do not occupy the scrotum), then the child is *probably* immature".]

2. **Still-birth**(=Natural death in utero).—Before deciding on its cause of death, it is safe to know if the child was still-born.
Causes :

(1) *Fœtal immaturity* or *debility* (rickets, lukaemia, &c.) or *malformations* (e. g., acephalous or anencephalous monster, extrover-

sion of heart, imperforate anus or gullet, constriction or obliteration of alimentary canal &c.)

(2) *Prolonged labour*—especially if (a) *child* is delicate, (b) there is *pelvic* deformity and (c) *liquor amnii* has drained away. [P. M. APPEARANCES in such cases : Big caput succedaneum, deformed head, congestion of, or hæmorrhages into brain, into spinal cord or into pleura, or peritoneum.]

(3) *Prolapse of umbilical cord, or pressure on it by foetal head* (as in breech presentation) or *homicidally*.—Asphyxiated, the child attempts to breathe in utero and, in its convulsions, expels meconium into liquor amnii. [P. M. APPEARANCES : (a) Those of death from asphyxia, with Tardieu's spots in pleura, pericardium, heart, thymus. (b) Stomach, lungs, trachea and bronchi contain meconium, vernix caseosa, liquor amnii.]

(4) *Strangulation of the child by its own cord*.—At the time of passing out, the movements of foetal head may cause knot in the cord and thereby bring about its death, in which case, the neck may show the indentation mark, but no abrasions. Child may from similar cause, be shrivelled up.

(5) *Precipitate labour*.—The sense of distension in pelvis (caused by the engaging part of foetus) is often mistaken for an urging to ease oneself, and, under such absolutely unprepared circumstances, the foetus may be *shot* out, into the water-closet !

(6) *Suffocation* from (a) death of *mother*, (b) spasm of its *larynx*, (c) *membranes* being carried forward over face, (d) retraction of *tongue*, (e) by *clothes*, (f) in urine, foeces, blood, or *liquor amnii*.

(7) *Hæmorrhage* : (a) *from cord* [When it is cleanly cut, the danger to life is greater, the nearer the cut is to navel] (b) In hæmophilic children, *from rectum or genitals*.

(8) *Abnormal presentations, diseases or separation of placenta, placenta prævia*.

(9) *Diseases of lungs, heart, cord, brain, etc. acquired in utero, or exanthemata, syphilis, malignant diseases, acute fever*.

MEDICO LEGAL POINTS : *Still-born corpses usually exhibit atelectasis pulmonum, lividities, ecchymoses and marks of strangu-*

lation and signs of death from asphyxia—all probably due to *natural* causes (b) *Fœtal blood* does not coagulate firmly.

3. **Duration of gestation** :—(a) *Normally* it is, on an *average*, 275 days (10 lunar months.) [Scientifically speaking, parturition is no actual multiple or 10th anniversary of the woman's menstrual period—for, *menstruation* and *ovulation* are not synchronous. The duration of pregnancy is uninfluenced by the sex of the child, and is not reckoned from the date of *insemination* but, from last date of last menses (for, insemination is not simultaneous with impregnation).] (b) The *maximum prolongation* known is 322 days. [But in all cases of protracted pregnancy, do not implicitly rely on so-called dates of last menstruation or of insemination—as there are elements of *miscalculation*, *infidelity* or of *premature suppression* of menses as well as *unduly prolonged* menses]. See chap. on Pregnancy.

4. **Viable age** = age at which a child can be born alive and continue to live, detached from and independently of its mother; it is on an *average* 210 days (intra-uterine). [There are authenticated cases of 175 days (Guy) and 174 days (Jardine case) and even 158th day is mentioned, the *lowest extreme* being 120th day.]

5. **Causes of so-called marks of violence** on infant's body :—

(a) **COMPRESSION** of head of *living* child produces 'caput succedaneum', petechial hæmorrhages and blood-effusion into meninges, etc; but, blows on head, *after* birth, do *not* cause them.

(b) **DIFFICULT LABOUR** may give rise to—*fracture of skull* (specially, frontal and parietal bones), *dislocation* of joints, fatal twist of *neck*, *hæmatomata* etc. [(i) *Contusions* or *fractures of skull* or even *mutilations of body* are not necessarily criminally done: they may be owing to artificial delivery or violent attempts at self-delivery on the part of the woman; (ii) *skull*

may or may not be fractured in utero, from accidents to the mother during pregnancy.]

(c) EFFUSION OF BLOOD UNDER MUSCLES of neck, ecchymosed marks on neck, mottling of skin or swelling of face, head and neck—may be due to (a) homicidal *throttling* or *strangulation*; but, oftener, they are due to—(b) accidental *pressure* on those parts, by maternal parts; and, (c) violent attempts at *self-delivery* on the part of the mother.

(d) LIVIDITY (even blackening) and SWELLING OF FACE AND HEAD are common in head-first deliveries and do not connote strangling.

6 **Crying inside genitals.**—Ogston records cases of children (with membranes ruptured, or head protruding from outlet) having cried in vagina or in utero (*vagitas uterinus* or *vaginalis*). The lungs of such a child or even of a child who cried after birth, may contain no air.

7. **Closure of Orifices & Ducts.**—As a result of establishment of respiration, ductus arteriosus, ductus venosus, and foramen ovale close up. But ductus arteriosus and foramen ovale have been found closed in children *before* birth—but never ductus venosus; also, all these have been found *persisting even in adult life* and the period of their closure normally is variable—hence, undependable.

8. **Expansion of Lungs not always dependable.**—(a) Ordinarily, *perfect* establishment of breathing completely inflates the lungs; but, in vigorous children, only 2 or 3 acts of respiration may do so. (b) On the other hand, occasionally, owing to diseased conditions, *non-respired* lungs may have considerable volume. (c) But, *after death*, it is impossible to *completely inflate lungs artificially*, by blowing mouth to mouth or through tube or by *artificial respiration* or by turning child upside down. Such procedures can partially expand portions and,

if much force is used, rupture the lung-tissues and cause emphysema under pleura.

9. **Putrefactive gases inflate lungs** to an extent to respond to the hydrostatic test. But such lungs when squeezed, sink in water, and, under pleura, are seen irregular-sized and irregularly arranged, projecting *blebs* which can be moved about. Putrefactive gases alter the *position of diaphragm*.

10. **Fallacies about Lung tests.**—I. (a) It is not possible to say from the lung and diaphragmatic signs as to whether the air found was due to natural or to artificial respiration ; for, artificial respiration may produce mottling (*Runge*). (b) If *partial* respiration occurs, red spots or patches may be found on the anterior border of right upper lobe. (c) Lungs that *have* respired may sink, owing to disease (pneumonia), atelectasis, non-expansion (respiration having occurred through bronchi).

II. THE HYDROSTATIC TEST (a) simply proves that the act of respiration was performed—but does not say, whether *naturally* or *artificially* ; (b) it does not prove *when* respiration was performed—before, during or after birth, though a *full* and *perfect* distension of lungs affords presumption of live birth, breathing *during* birth being imperfect and partial ; (c) it is answered by lungs *decomposed* or *artificially* inflated : decomposed lungs when squeezed under water evolve irregular-sized, large bubbles and sink ; (d) and it is not answered by portions of lung that breathed but have become *hepatised* or *congested* or formed *tumours*.

11. **Heart beats in Asphyxia.**—In asphyxiated children or in children born with suspended animation, the heart goes on beating much longer than in adults.

12. **Poisons** cannot be administered homicidally to infants, until they are born ; no poison can be given to a child yet unborn or during its birth ; nor does its administration, if at all possible, help paturition in any way.

13. **Death by drowning**, in cases of (*a*) infants who *have breathed*, presents identical post mortem appearances with those of adults ; but (*b*) if the infant has *not breathed*, there is no characteristic sign, specially, if the child has been killed by immersion of its face only. Remember that a child killed by other means may be thrown into water.

14. **Precipitate labour**.—Death due to it (while the woman wrongly feels a call for easing herself) is not infanticide. An umbilical cord is usually 18" to 20" long and a fall of 30" may put no strain on the cord ; it may get torn within 2" of navel. Precipitate labour kills children (but not immediately) from (*a*) even slight *bleeding* from torn cord (at or near navel) (*b*) stellate, fissured *fracture of parietal bone* (*c*) child's *aspirating* liquids &c. into its air-passages. [If cord is **FORCIBLY TORN**, the jelly inside it becomes heaped up irregularly : to determine this, examine the divided end with a lens.]

15. **Post mortem appearances of :** (1) Being **overlain or smothered** to death : Flattening and paleness of one aspect of *face* ; lividity and swelling about head and rest of the face ; congestion of *lungs* ; Tardieu's spots (subpleural) and hæmorrhage into thymus. [Tardieu's spots connote absence only, of air from lungs (no matter whether from disease, asphyxia, or pressure on cord during birth &c.) : if child never breathed before, Tardieu's spots are not likely to be found]. (2) **Strangulation**—**HOMICIDAL** : deep, broad, ecchymosed furrow *on neck*, with swelling on both sides of it and extravasation of blood beneath and injury to skin, muscles and wind pipe ; *tongue* is protruded between lips, *fingers* are clenched ; venous condition and distribution of *blood* ; *brain*, *scalp* and *lungs* are congested. **ACCIDENTAL** : a faint, livid, unabraded mark (or, neck is only slightly ecchymosed superficially.) (3) **Death from compression of cord** (before establishment of

respiration) : *Brain* is congested, ecchymotic spots on surface of *heart, lungs* and *thymus* are present.

16. **Mark on neck of fœtus & Strangling.**—(a) A child may be *born alive*, with marked indentations of the umbilical cord on its neck. (b) A ligature mark on neck, made *within one hour of death*, is like one made in life. Whether a *living* child breathed or not, the MARKS on the neck will be the same, so long as blood is circulating. (c) Medical evidence cannot prove occurrence of *strangulation during or immediately after birth*. As a rule, a child dies, without breathing, if, during birth, its umbilical cord gets twisted round its neck ; occasionally, it may, on birth of its head, begin to breathe, but the cord being too short, it dies of 'strangulation' before its birth can be completed. (d) Strangulation can occur only *after* breathing has taken place ; hence, fatal constriction of neck *before* birth (*i.e.* before establishment of respiration) is not strangling. (e) *Women have been known to put ligature round the neck of a fœtus, not with homicidal intent, but to assist its birth.* (f) The neck of a *stout* child exhibits *natural folds* and furrows simulating constriction-marks ; also, repeated, forcible bending of head forwards, soon after birth, causes a mark on fore part of the neck.

17. **Overlaying & Status lymphaticus.**—Some cases of so-called overlaying may, in reality, be death due to *status lymphaticus* (hypertrophied thymus).

18. **Causes of Infantile Asphyxia :** (besides the causes enumerated under 'suffocation', p. 323), birth with intact membrane, spasmodic retraction of tongue, swallowing food the wrong way, accidental overlaying, convulsion, precipitate labour into a bath-tub or cess-pool or mother's own discharges, strangulation by its own navel-cord.

19. **Breathing and live birth** are not synonymous. *Eye-witnesses* may depose to having seen signs of life in a

newly-born infant and yet no lung-signs of respiration may be found, *post mortem* ; hence, courts rely less on negative lung-signs cited by medical experts and more on eye-witnesses' testimony as to breathing or other signs of life. For, *proof of respiration* shows that the child breathed, but not necessarily that it has been *completely born* alive, out of its mother. Children have been known to have breathed (but never perfectly), to have cried (\therefore breathed while inside uterus or vagina or while their head protruded from vaginal outlet), or, a child may be born alive but destroyed before it has breathed : of this, there is no medical proof.

20. A child may be born alive and its lungs may not show signs of breathing, on account of being (*a*) born in its caul (entire membranes) or (*b*) asphyxiated, or, (*c*) with suspended animation. (*d*) A child's chest may move, as during respiration, or actual efforts at respiring may be made by it and yet its lungs be solid, with the placental circulation or penetration of air into bronchi and bronchioles going on,—aeration of blood at these places sufficing to keep it alive ; such a child may *cry* and be alive some hours. A child may thus live many hours after birth, *without breathing*.

21. Maternal death and foetus (specially suddenly).—

(*a*) The longest period after this when a living child has been delivered alive, is 26 minutes. (*b*) Putridity of discharges from maternal genitals does not evidence intra-uterine death of foetus. (*c*) As the result of putrefaction, *post mortem delivery* of foetus and placenta with or without inversion of uterus may occur. (*d*) A child **born in its caul** (membranes) may live for 15 minutes or more, inside it.

22. Putrefaction (Maceration) in utero—with membranes intact (Not so rapid).—Whole body is unnaturally *limp* ; it has a heavy

sickly *odour* about it ; the *cuticle* is reddish brown (turning green on exposure to air), and that of hands and feet is white and raised into *blebs*. *Bones* are detachable from soft parts. If body lies in-utero for some weeks, it gets covered over with *adipocere* or calcium phosphate. [Intra-uterine maceration conclusively proves still-birth ; but after birth, ordinary putrefaction so completely and rapidly changes previous signs of maceration, that their absence is not accepted as proof of live birth.]

22. **Tests.** (1) *Starch* : granules are stained with iodine-water and seen under microscope. (2) *Sugar* : To concentrated aqueous solution of contents of stomach + CuSO_4 + KOH + heat = yellowish or reddish ppt. (Trommer's test). (3) *Milk sugar*.—See oil globules of milk under microscope and apply Trommer's test to milk sugar. *Mæconium*.—See p. 126.

CHAPTER. X.

SEXUAL RELATIONS.

(A) IMPOTENCE AND STERILITY.

Definition : *Impotence* = lack of ability to perform *sexual act*. *Sterility* = lack of ability to *procreate* children.

Questions of impotence and sterility arise, when—

1. **Divorce is sought.**—If marriage cannot be consummated, it can be dissolved, provided, (a) that one of the parties is incapable of complete sexual intercourse ; (b) that the incapacity cannot be surgically remedied, or, the defective party is unwilling to submit to a surgical operation ; and, (c) that the incapacity existed before marriage. [An impotent individual

need not necessarily be sterile, nor a sterile individual impotent. Sterility, by itself, offers no ground for divorce.]

2. **Legitimacy** of a child is contested, in a case of adultery
3. **Rape or Bestiality** is imputed to a person.
4. A **childless rich widow** alleges herself pregnant at time of her husband's death and thereby claims control over the estate.

Normal Sexual Relations :

I. "**Potence**," (a) IN CASE OF MALES=(1) *Erection* of penis and (2) *Discharge* of healthy semen containing living spermatozoa. (b) IN CASE OF FEMALES=(1) Development of external and internal genitals ; (2) *ovulation* and *menstruation*.

II. **Puberty**.—is the epoch of life heralding potency ; it depends on (a) climate (b) constitution (c) moral circumstances. [Figures within brackets indicate age of attainments.]

	<i>In Males</i>	<i>In Females.</i>
<i>Commences</i>	14 to 16 years of age	11 to 13 years of age.
Body	Becomes manlier.	Breasts enlarge. (12-14)
Voice (14-13)	Becomes manlier.	Voice deepens.
Hair (12-18)	Grows on pubis, armpits, face, chests &c.	Grows on pubis, armpits.
Generatives :	Testicles larger, more sensitive ; Penis longer Semen contains living spermatozoa. Nocturnal emissions occur.	Genitals increase in size. Menstruation and ovulation begin.

III. Anatomical Homologues in Males and Females

<i>Female Parts.</i>	<i>Male Parts.</i>
Round ligament.	Gubernaculum testis
Fallopian Tubes.	Cornua uteri masculinus.
Vagina and Uterus.	Prostatic vesicle. Uterus masculinus.
Main tube of Epoophoron	Epididymis.
Ducts of Gaertner.	Vas Deferens
Tissue uniting female urethra and vagina.	Prostatic gland.
Clitoris.	Glans Penis.
Nymphæ.	Prepuce.
Labia majora.	Scrotum.

Causes of impotence : [* Apply to *males* only.
† Apply to *females* only ; those unmarked apply to *both* sexes.]

I. Organic :

1. NERVOUS LESIONS* : Diseases of, or injury to, brain or cord (lumbar ataxia ; syphilis of spinal cord, myelitis ; hemiplegia ; injury to back of head ; mental alienation).

2. MALFORMATIONS OR ABSENCE OF PARTS : *Penis may be absent, non-developed, ill-developed or two or more in number ; hypospadias ; adhesion to scrotum or abdomen ; fibrous or cartilagenous induration, congenital phimosis, anorchidism, cryptorchidism ; diseases of or accidents to or operations on penis, testicles or ducts (perineum) ; † atresia or narrowness of vulva, absence of uterus, tough hymen or vagina. [Though according to law, a boy under 14 is impotent, in fact, he is not always so . Also—*obesity*.

3. INFLAMMATIONS OR CICATRICIAL CONTRACTIONS.† *Vaginitismus*. Krauroses vulvæ ; internal piles.

4. TUMOURS* :—Elephantiasis, hernia, big hydrocele.

II. Psychological.*

1. Absence of voluptuous *thoughts*.

2. *Repugnance* towards individuals, *fear*, *timidity*, *excessive passion*. [For this reason, a man may be potent towards one woman and *impotent* towards another].

III. Atonic.* [∴ often temporary impotence].

1. *From general diseases and conditions* :—Old age, too frequent coitus, wasting diseases (diabetes), anæmia, uræmia, cholæmia, rheumatism, diphtheria, heart disease, chronic nephritis, acute febrile conditions, parotitis.

2. *From over-indulgence in drugs* : Lead, potassium iodide ; opium, cannabis indica and other narcotics ; CO₂, CS₂, alcohol, tobacco, thyroïdin.

3. *From chronic irritation of the genital passages*—due to gonorrhoea, stricture, masturbation, vaginismus.

To examine a case for Impotence :—

Note—(1) Age. (2) General appearance. (3) Habit of body. (4) State of health. (5) History of sexual life.

Ascertain : (1) Past ailments. (2) State of development of genitals. (3) If course of orifices is patent and natural. (4) State of prostate.

Do not artificially stimulate the organs.

Causes of sterility in Males :

I. A-SPERMIA=*entire absence* of semen. Due to :—

(1) Imperfect coordination of ejaculatory muscles. (2) Obliteration of some portion of urethra (from traumatism, gonorrhoea, or syphilis), wasting of testicles (from tuberculosis, or tumours) ; injury to ejaculatory duct (from perineal operations etc.) (3) Hypospadias, epispadias, urethral fistula, absence of penis. (4) Impotence : failure of insemination into vagina.

II. OLIGO-SPERMIA=*diminution* of semen in quantity.

Or, OLIGO-ZOO-SPERMIA = *diminution* in number of *spermatozoa*—

III. A-ZOO-SPERMIA=*absence* of *spermatozoa*. [Causes : ill-development, absence, degeneration, malignant disease, syphilis or tuberculosis of testicles ; epididymitis, sexual excess &c. ; mumps ; extreme youth.]

Causes of sterility in Females :—(1) *Absence* or *disease* of vagina, uterus or ovaries. (2) *Ill-development* of uterus or ovaries. (3) *Occlusion* of vagina, neck of uterus, fallopian tubes. (4) *Promiscuous intercourse*. (5) Profuse or acrid *discharges*. (6) Forced acclimatization (in rare cases).

Medico-legal points :

1. **Legal objects of marriage.**—HINDU law insists on the ability to procreate children as the ultimate object of marriage ;

in every OTHER LAW, a power of complete sexual intercourse (without reference to capacity for conception) is necessary to constitute the *marital bond*.

2. **Legally**, in India, a boy under 7 years of age, and, in England, under 14, is impotent. The age of consent to females is 12 years in India and England.

3. **Impotence and sterility** are *not dependent* on each other. An impotent individual need not be sterile; nor a sterile individual impotent.

4. **Semen** is an alkaline fluid, made up of the secretion of—testicles, seminal vesicles, prostate glands, Cowper's gland and urethral crypts and follicles. *The amount* of semen discharged at one orgasm is from one to two drams.

5. **Spermatozoa** (a) at the time of ejaculation, and for about 24 hours afterwards (if evaporation is prevented), should be in *active motion*. (b) Inside the female genital tract, spermatozoa *live* for 17 days and travel towards uterus. Deposited in the posterior fornix, they may remain alive throughout a menstrual period too (Bossi). Impregnation has followed rectal coitus from spermatozoa travelling through recto-vaginal fistula.

6. **Impregnation** (a) usually occurs very soon after menstruation. (b) It is possible after *artificial deposition* of semen within vulva. (c) It is possible also by insemination through a *misplaced orifice* in or from *amputated urethra*, into even a very small vagina. (d) Impregnation of women in *a bath or from clothes* containing semen is not to be relied on.

7. **Removal or extensive disease** of both testicles and both ovaries, after attainment of puberty, (a) makes an individual sterile, but does not at once destroy sexual power or desire. (b) Even after removal of both testicles, the first two or three acts of coitus may be *fruitful*; if, however, no coitus takes place

after castration (double), semen will be found in the vesiculæ aeminales after death. (c) If one of these (or even *part* of one) remains, impregnation is possible (even upto 10 years, as in Sir Astley Cooper's case) through semen contained in vesiculæ seminales. (d) **Cryptorchids** are not necessarily sterile though often so. (e) Small sized testicles are compatible with potency. (f) *Monorchids* are perfectly fertile.

8. **Age & Fertility in Adult males.**—(a) *Power of erection lasts* from shortly after birth till about 65th year (more or less); it is generally, but not invariably, *suspended* during wasting illness (acute or chronic); but, in diseases or injuries to nervous centres (unless very severe or chronic), rapid *recovery* of this power may occur. In mental alienations, specially, in general paralysis of the insane, it is at first stimulated, then lost. (b) The *power of coition* begins earlier and ceases later than that of procreation. (c) The *fecundating power* may remain even up to 100th year of age, it being *lost*, not on account of loss of secretory power (which is not necessarily coeval with advancing years) but on account of obliteration of the canal of epididymis, vas deferens and vesiculæ. (d) The *sexual instinct* is not intermittent (as in animals), and varies in intensity according as there is collection or expenditure of semen; in women, it increases with the process of ovulation. (e) *Avulsion* of genitals, *amputation* of penis, enlargement of *prostate* do not destroy sexual power or instinct, but, on the contrary, *tend to increase it*.

9. **Puberty, potency and procreative powers** are not necessarily coincident. Fertility is indicated by developed appearance of ova or of spermatozoa in semen; *usually* it does not commence earlier than 14th year; in cases of precocious development, it does.

10. **Menstruation** (a) does not connote *bodily* development but is *usually* (not invariably) the signal that a girl is fit for im-

pregnation ; the *absence of menstruation* does not connote the reverse. [Regular, periodical, bloody discharge from vagina may be due to polypi or *other diseased conditions*.] (*b*) Menstruation may occur even *in infants*. (*c*) It generally *ceases* at 'menopause' (between 45th and 50th years) and may be stopped earlier by diseases. (*d*) It may *vicariously take place* from eyes, nose, ears, mouth, breasts, extremities, ulcers &c. **Ovulation** (∴ fertility) begins with, may precede or follow, or occur without, menstruation, and even after menopause.

(B) HERMAPHRODITISM.

Definition.—It is the existence, in the *same* individual, of (*functionally active*) *testes* and *ovaries*. [But, in practice, both of these cannot be sexually active ; even if they were so, the individual could not have power of self-reproduction. Practically, therefore, the term indicates presence in the same individual of *anatomical* testes, ovaries, etc. or malformations of them.]

Necessity and means of ascertaining sex :—See pp. 54 & 55. Questions arise at times of—education, marriage or entering a career. Determination of real sex depends on the functioning organ present (menstruation or ensemination). As *male* pseudo-hermaphrodites are commoner, in all cases, a child of doubtful sex should be brought up as a male.

Classification :

I. True or Vera (*internal* organs of *both* sexes present):

1. *Lateral* = Ovary on one side, testicle on the other.
2. *Bilateral* = Both ovary and testicle, on both sides.
3. *Unilateral* = Ovary and testicle on one side ; on the other, either testicle or ovary or none.

Another classification (Sir J. Y. Simpson).

- I. *Lateral* = testicle on one side and ovary on the other.
- II. *Transverse* = external organs male, internal organs female or vice versa.
- III. *Vertical or Double* (3 varieties) : =
 - (a) Ovaries with combined male and female passages.
 - (b) Testicles with combined male and female passages.
 - (c) Ovaries and testicles co-existing on one or both sides.
- II. **False or spurious** (*external organs alone* are abnormal) :
 1. MALE = Androgyni = womanly man.
 - (a) *Internal* = testicle and external male genitals + uterus, vagina and perhaps fallopian tubes.
 - (b) *External* = testicle + external female genitals + female build of body.
 - (c) *Complete* = testicles + uterus, Tubes + female external genitals.
 2. FEMALE = Gynandry or Androgynæ = manly woman.
= Ovary + enlarged clitoris ; hirsute development on face.

(C) MONSTERS.

Definition.—A monster is a being which has not externally the shape of mankind, though born of wedlock. [Supernumerary organs, transposition or malformations of internal organs do not, per se, constitute monstrosity, according to law ; each court demands to know from the medical man, a true description of the monstrous birth and draws its own inference.]

Legal Status :—According to law (a) a monster is without all *civil* rights ; (b) he cannot be *destroyed* because of his monstrosity ; and (c) he cannot be publicly *exhibited*.

Artificial production of monsters has been successful.

Varieties :—“*Union of several foetuses, union of two distinct foetuses by a connecting band ; union of two distinct foetuses by an osseous junction of cranial bones ; union of two distinct foetuses in which one or more parts are eliminated by the junction ; fusion of two foetuses by a bony union of the ischii ; fusion of two foetuses below umbilicus into a common lower extremity ; bicephalic monsters ; parasitic monsters, monsters with a single body and double lower extremities ; diphallic terata ; foetus in fetu and dermoid cysts ; hermaphrodites.*”

(D) LEGITIMACY & PATERNITY.

Definition.—**Legitimacy** is the quality of a child being the fruit of lawful wedlock, *i. e.*, ‘being born during the continuance of a valid marriage between the child’s mother and any man, or, within 280 days after its dissolution, the mother remaining unmarried.’ A child not so born is a **bastard** or **illegitimate** child. (I. E. A. § 112).

Questions arise in cases of—

1. *Supposititious child’s Succession to an estate*,—he being set up as child of his alleged parents.
2. *Children born during absence of husband for nine calendar months.*
3. *Alleged misconduct, adultery or rape*, with or without production of a supposititious child.
4. *Affiliation*—*i. e.*, cases where an illegitimate child claims maintenance from its alleged father.
5. *Tenancy by courtesy*—*i. e.*, cases where a husband enjoys the estate of his deceased wife, who has left a living child, “born during the life-time (*i. e.* the continuance of the marriage tie) of the wife.” By Indian Succession Act, 1865, §§ 4 and 331, no person, married after 1st January, 1866, shall

by marriage, acquire any interest in the property of the person to whom she or he is married.

Medico-legal points.

1. According to law (1) A child born *during marriage* is deemed illegitimate, when it is conclusively proved that it was impossible for the husband to be the father (Blackstone). (2) A child born of parents *before their marriage* is illegitimate in England but legitimate in Scotland, if the couple marry afterwards. (3) A child brought into the world by *Cæsarian section* during its mother's life time is legitimate but *after its mother's death* is illegitimate; in the latter case, it ceases to allow tenancy by courtesy to its father (4) '*Access*' means sexual intercourse (Banbury Peerage case (1 S. & S., 155, 1811).

2. **Superfoetation** = birth of two more or less mature children, the one, 1 to 6 months after the other. This is *popularly* believed to be the result of *two separate acts of coitus* (probably with *two different men*). But, *scientifically* speaking, (a) *one ovum may divide* and each half of it develop fully (super foecundation); or (2) *two ova may escape* at two different acts of ovulation and be fertilized (Super-foetation). Or, it may be due to conception in a *bipartite uterus*, one child developing at the expense of the other, which latter is not born till after having attained some growth in utero.

Modes of determining legitimacy :—

1. **Moral evidence** (most important). 2. **Legal evidence.**

3. **Medical evidence**—to determine—

(a) **Potency** : Were its parents physically competent to procreate ?

(b) **Access** : Had the alleged parents sexual access within the period of—(i) Natural term of pregnancy (280 days); (ii) Shortened (270 days), or (iii) Prolonged (293 days) terms ?

- (c) *Pregnancy* : Did this woman ever have a child ?
- (d) *Age of child* (as proving *duration of gestation*) : Is the child mature or viable or does it bespeak Superfoetation ? or substitution ? Be guided by the development of the foetus, rather than by its age, weight and size.
- (e) *Proof of paternity* :—from (i) Paternal *likeness* of features, figure, gesture, voice, tricks of manner etc. (ii) Transmitted personal *deformities* of parents (iii) Transmitted *diseases*. Atavism may cause absence of these all. [Children born in adultery, resemble better the legal, rather than the real, father.]

Questions regarding INHERITANCE are—

1. Has the child produced, '*the state of mankind*' ? (*i. e.*, is it or is it not a 'monster' ? [Determine by reference to p.]
2. Is the child of the *sex* mentioned in the 'will' ? [See p.]
3. Is the child *legitimate* (*i. e.*, is it really the child of its parents ? or is it a supposititious child ? [See p.]
4. Was this child *born alive* during *life* time of its mother (in 'tenancy by courtesy case.) ? [Eye-witnesses necessary].

(E) PREGNANCY AND DELIVERY.

Required to be determined in cases—

1. Where a **condemned female criminal** prays for remission of sentence of *hanging* or of *hard labour*. (Cr. P. C. § 382). [*English* law requires the woman to be with child of a "quick child"—*i. e.*, she must have subjective sensations of its movements in utero. But, as a woman may run through her pregnancy, without having ever felt the 'quickening', in practice, the fact of pregnancy, apart from the period or sensation of it, is taken into consideration.]

2. Where a rich **childless widow** is suspected of **feigning pregnancy**, in order to possess the estate left by her husband, on behalf of a *future heir*. [The writ '*de ventre inspiciendo*' used to be issued by English courts in these circumstances.]

3. In Breach of promise of marriage cases,—where a female desire to **extort money** or to lead to **compulsory marriage**.

4. In **Adultery** cases—where intercourse has to be proved.

5. In **Murder or suicide** cases,—where the existence of pregnancy supplies a motive for it (as in cases of *virgins* or *widows*.)

6. Where an **infanticide** is ascribed to a woman.

7. Where somebody is charged with causing or attempting to **cause miscarriage**.

8. Where the **chastity** of a women dead is disputed.

9. As a means of **identifying** a female corpse.

Medico legal-points :

1. *Uterus returns to its normal size (involution)* in about six weeks ; and, by the 10th day, it sinks behind symphysis pubis. It does so, at a different rate in different women. **Lochia** may continue to a month and a half (= weak involution).

2. The **earliest period** after delivery, when it is possible for a women to **conceive again**, is 14 days.

3. **Menstruation & Conception**—**MENSES** may (a) *appear* at any age between 9 and 25 ; (b) *continue upto* any age between 35 to 55 or even later. (c) Though each woman is a law unto herself, *menses return* usually within 3 or 4 months after delivery, whether sucking at breasts is stopped or not ; (d) in rare cases, *menstruation* may go on regularly every month, during the whole of pregnancy, though it ought not go on after 3rd month. (e) A woman who has *never* menstruated, may also become *pregnant*.

4. There is no limit to the child bearing age of women ; Dixon Mann quotes cases at 49, 50, 55, 59, 72 years ; usually menopause (which comes on between 45th & 50th years) marks the era of cessation of child-bearing.

5. **Duration of Pregnancy.** (See p. The longest and shortest periods of gestation observed have been as follows :—

<i>Name of observer</i>	<i>Longest</i>	<i>Shortest</i>	<i>No. of Cases</i>
Guy	293 days ...	270 days ...	14.
Wharton & Stille	296 ...	260 ...	56
Ahlfeld ...	329 ...	231 ...	425

In *animal observations*, there have been wide ranges of time and not a fixed standard ; in men, therefore, where *deductions* are made from last act of coitus or last date of menstruation or last living with husband, the variations are necessarily wide.

6. **Delivery simulating menstruation.**—In first 3 months of pregnancy, foetus and its appurtenances are usually expelled *en bloc* ; thus, a real miscarriage may pass for a menstruation, unless, the products of conception are carefully or microscopically noticed. The placenta and foetal membranes may not however in all cases be simultaneously discharged. [In the last six months of pregnancy, however, expulsion of foetus is followed by the expulsion of placenta and membranes.]

7. **Fallibility of Signs of delivery.**—(a) The PASSAGE OF A LARGE POLYPUS gives rise to local signs that simulate very closely those of natural delivery ; but a consideration of the *totality* of signs and symptoms hardly fails to elicit the truth. (b) In many instances, the ovum escapes first, leaving THE DECIDUA behind, which come away later on ; and in some *virgins*, decidua-like structures are shed by mucous membrane of uterus, which even experts may confound with *pregnancy-membranes* [Kitson *vs.* Dr. Playfair, 1884.] (c) CORPUS LUTEUM :—It is not possible to differentiate a *true* (i.e. ovulation

resulting in conception) from a *false* one (*i. e.*, not so resulting) Pregnancy is possible *without* a corpus luteum. Bodies undistinguishable from true corpora lutea have been found in old women, who have *never* been pregnant.

8. **Volition & consciousness in relation to pregnancy and Delivery.**—(a) *Volition*, venereal orgasm, consciousness, consent or introduction of the male organ—not one of them is absolutely necessary to *impregnation*. It is possible to become PREGNANT from *coitus against will*; or (ii) in *unconscious* states. (b) In multiparæ, DELIVERY is possible (i) *during natural sleep*, without wakening the woman; or (ii) *without pain or warning*, during walking or urinating; or (iii) during the somnambulistic state; or, (iv) *during a fit of unconsciousness*; but on regaining consciousness, she becomes rapidly aware of it.

9. **Moles** may be retained in utero indefinitely. *Hydatid* mole=dropsy of villi; *carneus* mole=hæmorrhage into chorion; *fatty* mole=fatty degeneration of placenta. Their presence points to pregnancy.

10. **To prove gonorrhoeal infection**, the most *thorough* and *repeated* bacteriological examination should invariably be made of *diverse parts* of the *uro-genital* passage.

11. **Fixing the period of Pregnancy.**—Except by specialists, it is *not possible* for an ordinary practitioner to diagnose pregnancy without erring, *before* 6th month. Hence, in doubtful cases, 2 or 3 months' or more remand may be obtained from court; and, if possible, the case should be examined more than once. In the earlier months, if compelled, state only in *broad* terms, the *probable* period, like—"between 2 and 3 months' &c.

12. **Time table of appearance of—**

(a) * *Morning sickness*—beginning of 2nd month to 4th

month, at most. [*Caution* :—This is found also in—drunkards or those with chronic Bright's disease.]

(b) *Blue discolouration of vagina*—from 2nd month. [*Caution* :—Also produced by local tumours.]

(c) *Irritability of bladder*—2nd to 3rd month. [*Caution* :—Produced by various other causes.]

(d) *Quickening* (=sensations experienced by mother of the movements of the foetus inside her womb)—during 4th month (middle) *i. e.*, 15th to 18th weeks. (Various authors put it at 10th to 26th week). [*Caution* :—Felt by hysterical non-pregnant girls too.]

(e) *Ballottement*—between 4th and 7th months.

(f) *Fœtal heart sounds*—from 5th month (18th to 20th weeks). They are 160 per minute in the 5th, and 120 in ninth, months of pregnancy. [Their presence is proof positive of pregnancy with a live foetus, but their absence does not prove the contrary, for, they may, for weeks, be not audible, foetus being alive.]

(g) *Uterine souffle*—from 4th month or earlier. [*Caution* :—Sarcoma pressing on iliac vessels may cause souffle.]

(h) *Contractions of uterus*—at end of 4th month.

13. **False Pregnancy** (Phantom tumour; Pseudo-cyesis).—A hysterical woman, as the result of her strong desires, may imagine that she is pregnant, and she may even perceive quickening; the abdominal muscles help in the distension of abdomen. Under chloroform, however, it disappears completely. [**Pigmentary changes** may be caused by argyria, Addison's disease, malaria, chronic uterine disease. **Breasts** in a *nullipara* may become pendulous; also, even after *prolonged* lactation, they may become firm again. They may show areolæ round nipple in a virgin too and areolæ may persist after delivery too. Sudden appearance

of milk in a primipara or stoppage of milk in a multipara is no sure proof of pregnancy.] *Lineæ albicantes* may result from simple stoutness.

14. Measurements of the uterus After delivery :—

	<i>At full term.</i>		<i>At Five Months.</i>	
	<i>Immediately after.</i>	<i>14 days later.</i>	<i>Immediately after</i>	<i>14 days later.</i>
<i>Length</i>	7 to 8 in.	5 in.	5 $\frac{1}{2}$ in.	4 $\frac{1}{2}$ in.
<i>Thickness</i>	4 in.	...	3 $\frac{5}{8}$ in.	2 $\frac{1}{4}$ in.
<i>Weight</i>	1 $\frac{1}{2}$ lb.	3 $\frac{1}{4}$ lbs.	...	...

Signs of Pregnancy.

In the living : (I) POSSIBLE (6) :—Amenorrhœa, morning sickness, salivation, longings, pigmentary changes, enlargement of abdomen. (II) PROBABLE (7) :—Breast-changes, internal ballotement, blue discolouration of vagina, increased pulsation in lateral fornix, softening of lower uterine segment, enlargement of the uterus, hypertrophy of the uterus. (III) POSITIVE (5) :—*Feeling* by physician of foetal parts and movements and of rhythmical contractions of uterus ; and *hearing* of foetal heart sounds and of funic souffle.

In the dead : Presence in uterus of :—(1) *Mole* (carneous, vesicular or hydatid). (2) *Lithopædion*. (3) *Fœtus*, or its membrane [A pregnant uterus decomposes more quickly than one unimpregnated.]

Signs of delivery :

* (A) In the living. (I) When Recent :—

I. BEFORE TERM (= Miscarriage or Abortion.) :—

* The signs of delivery, in the EARLIER months of pregnancy, may disappear within 24 hours. *Delay in examination* (after 24–36 hours in early cases and after 8–10 days in full-term cases), strong and vigorous health of the woman and immaturity of ovum render signs of delivery ambiguous, if not undetectable, in most cases.

- (1) *Cavity of uterus*—is enlarged. (2) *Os*—is patulous.
- (3) *Bloody discharge* from uterus—is present.

II. AT TERM :

(a) WITHIN 48 HOURS :

i. *General Changes* [Not very constant ; often concealed].

1. *Languid and exhausted look*. [Its duration varies with (a) the state of mother's health and (b) ease of delivery ; some women are exhausted, others are not and can resume laborious work forthwith. Such a condition is common during menstruation too].
2. She may be *perspiring* (from exhaustion).
3. *Pulse and temperature are normal*, or, perhaps, pulse falls to 60 to 70. [A rapid pulse is never noted after normal, *uncomplicated* labour.] [Unusual pulse and temperature-conditions are found also during menstrual period in some women.]
4. *Faint peculiar heavy odour* is perceived about her.—This is due to vaginal discharge and usually disappears within 10 days. [It may be present during menstruation too in some women.]
5. *Dark circles* are found *round eyes* ; and a dark line between pubis and navel.
6. *Lineæ albicantes*—are present. [These may be caused also by distension of skin, apart from pregnancy.]
7. *Abdomen*—looks full, but its walls are lax.
8. *Breasts*.—knotty, tender ; milking ; areolæ darkened
[A virgin's breast may also secrete milk.]

ii. *Local Signs* :—

1. *Vulva*—gaping, tumid, (probably) abraded.

2. *Fourchette*—torn, if child be born at full term and alive.
3. *Perinæum*—lax and perhaps torn (specially in first deliveries). [Note the age of the tear—See p. 56].
4. *Vagina*—dilated, lacerated and bathed in lochia; its rugæ are absent.
5. *Cervix*—flabby, lacerated or torn (even in easy labours), blood oozing from tears; it is patulous (admitting three fingers) and remains open at internal os for 24 hours or less. [Blood oozes similarly also in endocervicitis.]
6. *Uterus**—bulky, easily felt, contractile on kneading.

[CAUTION.—Uterine and ovarian diseases often produce symptoms simulating those of delivery, and even in easy, normal deliveries, the cervix looks bruised, just as the interior of uterus looks congested after menstruation.]

* Nulliparous uterus	vs.	Parous uterus
Length total=3"		3¼" to 3½"
Cavity 2½"		2¾" to 3".
Length of body=2"		2"
of cervix=1"		1¼"
Weight=1½ to 2 oz.		Weight=2 to 2½ oz.
Top of fundus is flat and lies on same level with fallopian tubes.		Arched upwards, above the level of fallopian tubes.
External os—round or transverse and smooth.		Os—is wider, and a round or transverse or irregular cleft.
Cavity of body—shorter, triangular.		Cavity of body—bigger and globular.
Cavity of cervix—is larger, fusiform and, marked by arbor vitæ.		Pigmentation at site of placenta and thickening of uterine arteries.

(b) THREE DAYS AFTER DELIVERY :

The above signs are found—more or less.

(c) AFTER 4TH DAY, ONWARDS.

Discharge—has a tendency to cease.

Langour—is passing off.

Genitals—are recovering their tone.

II. When Remote (*i.e.*, where delivery of a foetus of over 6 months' age took place, say, 6 months ago)—Judge from a totality of these and never from any one or more of them singly :—

1. **BREASTS**—are pendulous, flabby ; may show faded secondary areolæ and lineæ abicantes and contain milk. *Nipple* is long.

2. **ABDOMINAL WALLS**—less firm, less elastic, striæ gravidarum are present.

3. **VAGINA**—relaxed, patulous. [An *entire* HYMEN goes against delivery ; a *ruptured* hymen, with its *fragments in continuity*, goes against delivery of a full-term child ; but—] *caruncule myrtiformes*, when present, prove delivery of foetus or of a tumour of big size.

4. **FOURCHETTE, & PERINEUM**—show scars. These, when *entire*, go against delivery but when *torn* may be due also to other causes than delivery.

5. **OS UTERUS**—irregular, or more circular, more open, and reveals slight scarring.

6. **UTERUS**—heavier, thicker, larger ; its *cavity* more round ; *cornua* of cavity is also round.

(B) **In the Dead** (*In addition to those found in the living*) :—

1. **UTERUS**—flabby and flattened ; contains *clots* for a day or two ; its *inner surface* is rugged in appearance ; *the site of placenta* is of the size of a palm of the hand (recognizable till

9 weeks after delivery), is sloughy, dark, showing big venous sinuses, filled with thrombi. After 6 months of delivery, it is a pigmented, slightly elevated area. At the *orifice of fallopian tubes*, orbicular arrangement of its muscle-fibres is distinctly visible. *It may contain* (if the woman was not delivered)—products of conception, hydatid mole, lithopædion.

2. CERVIX :—Inner surface bruised and lacerated (even in natural labours) ; its enlarged size, flabbiness and gaping will depend on the period elapsed since delivery.

3. VAGINA—shows carunculæ myrtiformes.

(F.) CRIMINAL ABORTION, FETICIDE.*

Definition : Legally, '*Miscarriage*' or '*Abortion*' is unlawful expulsion of the products of *conception*,—no matter, at which ever period of gestation, or, whether it be a living child or a fleshy mole, whether it be from the uterus or fallopian tube.

Medically,—'premature labour' occurs during the last 3 months, 'miscarriage' during the 2nd 3 months and 'abortion' during the first 3 months.

Points for investigating a case :—

I. Has the uterus been 'recently' and 'really' emptied ? If it has been, look for—Signs of delivery.

* **Accidental or spontaneous abortion** is caused by :—

A. MATERNAL CAUSES—I. *General* : Acute diseases ;—fevers, zymotic diseases ; advanced Bright's, heart, lung or liver disease ; hyper-emesis, overlactation ; anæmia ; syphilis, lead or copper or gaseous poisoning. II. *Nervous* : Sudden emotion, fright or grief ; chorea ; excessive exhaustion. III. *Local* :—Badly managed uterine or ovarian diseases. Tumours, malpositions, inflammations, coitus during pregnancy. Placental disease, climacteric.

B. FETAL CAUSES—Diseases of itself or of membranes, from syphilis, or other diseases, degenerations, congestion, malnutrition, inflammation, hæmorrhage, accidents, torsion, etc.

WHAT is the expelled substance? Is it a mole, hydatid, or a fibroid, or dysmenorrhoeal false membrane or a foetus?

IF A FŒTUS, what is the *age of it*?* [If it is a full-term child, possibly, the case is not one of miscarriage. But have proofs ready of (i) the degree of its *maturity*, of (ii) its having been born *alive or dead* and (iii) of the *causes* of its death]. [Delayed reports are suspicious].

II. Was uterus spontaneously emptied? [(a) If so, what *causes of accidental abortion* are present? (b) Was the woman given *regularly to abortion*? (See p. 365)

(c) Did *she take any medicine* for any 'female complaints'? What were its nature, dose and frequency? Were the dose and frequency excessive? If so, why was this drug specially selected and why the big dose and greater frequency? Did she take it *herself* and intentionally? Was it *given her by somebody else* to take? If so, what were his intentions? Did the prescriber know the nature and action of the drug?

* Table for determining age of fœtus :—(Also see p. 328).

Age in months.	Length in inches.	Weight in lbs.	Characteristics seen :
1	$\frac{1}{3}$ "	20 gr.	Size, of that of an ant. Two dark spots where <i>eyes</i> should be ; <i>limb-buds</i> visible ; <i>mouth</i> is a cleft ; <i>Head</i> , a swelling
2	$\frac{1}{2}$ "	40 to 75 gr.	Nasal, aural, ocular and oral openings distinct : <i>head</i> differentiating from trunk. <i>Membrana pupillaris</i> present.
3	3"	$\frac{1}{16}$	<i>Fingers</i> and <i>toes</i> found ; neck and chest distinct from <i>abdomen</i> .
4	$5\frac{1}{2}$ "	$\frac{3}{16}$	<i>Sex</i> distinct. <i>Skin</i> firm.
5	6"	$\frac{1}{10}$	Nails, hairs, Bile found <i>Eyelids</i> closed.

III. Was uterus artificially emptied? If so, (a) Are there any local marks, injuries or foreign substances inside the uterus? Or, are these marks due to *natural* delivery? What else is the explanation of their presence? (b) What is the *past history*, in detail, of her *generatives* and of former deliveries?—Are there any chronic discharges or diseases? (c) Are there any signs of violence on other parts of her body? If so, how are they accounted for, medically? [(d) Does the child's body show any marks of violence? Is its shape or size responsible for wounds found on the mother's genitals?]

IV. What have been the consequences of such emptying, on the health or life of the mother? Is death or any disease the result solely of this?

V. Examine every orifice of body and send viscera to Chemical Examiner.

Modes of procuring criminal abortion in India :—

(A) By Drugs taken internally : The following (taken alone or in combination) are reputed, but are not certain, as abortifacients, except when given in *poisonous* doses :—

Absinthe, oil (in pills.)

Ach (*Morinda citrifolia*)

* *Akanda* (*Calotropis gigantea*) (juice).

Anethum graveolens seeds, *Sowa*

Aloes (*Musabbar*) as *Hierapicra* or *Pilacotia*.

† *Apiol* (*Petroselinum sativum*).

Arsenical compounds.

Asarum arabicum.

Bamboo leaves (juice)

Black-pepper (*kala mircha*),

* Borax (*sohaga*).

Camphor.

† Cantharides.

* Carrot seeds (*daucus carota*), (*gajar*).

Caulophyllum thalictroides.

† *Cimicifuga* or *Actea Racemosa* (black-snake root, *cohosh*).

Celastrus paniculata. (*jyotismati*, *malakangni*)

Chamomile.

Copper sulphate (burnt) *Tootiya-bhasma*.

* Cotton (seeds and root bark).

* Favourite with Indians.

† Favourite with Europeans.

Modes of procuring criminal abortion in India—*contd.*

- Cucurbitaceous tubers (*bishalambhi*, *karala*, *kadavanchi*).
 Cuscuta reflexa (*algushi*, *akas bel*)
 + Diachylon or lead oleate plaster
 Digitalis
 † Ergot in large doses.
 Fern (decoction of male fern.)
 Ferrous sulph. Ferric chloride.
 Gloriosa Superba, (*bisalya*).
 Guaiacum.
 Guinea-pepper.
 Horehound.
 Horseradish bark (*moringa pterygosperma*).
 Hydrastis canadensis.
 † Juniperus sabina (*savin leaf* or oil; and other strong diuretics).
 Laburnum cystisus.
 * *Lal-chitra* (*plumbago rosea*) & other euphorbiaceæ plants)
 Lead salts (plaster)
 Manganese dioxide.
 Mercury (metal or perchloride or sulphide)
 Mugwort
 * Mulberry (*toonik*)
 Myrrh (*gandha-bole*).
 * Nerium odorum (*swet karabi*).
 Nitre (*sora*).
 Nutmeg (*myristica fragrance jayaphal*).
 * Oleander (*thevetia neriifolia*) (*belika-phool*).
 Opium (*Afim*)
 Pan root.
 Paradise
 † Penny royal (*mentha pulegium*)
 * Papaya carica (seeds).
 Phosphorus.
 * Pineapple (unripe fruit or seeds)
 Pituitary gland extract.
 Pot. bichromate, iodide, nitrate, permanganate, sulphate
 Pulsatilla anemone.
 Quick lime.
 † Quinine (in large doses).
 Randia dumetorum (*madan phal*).
 † Rue (*ruta graveolens*).
 Saffron.
 * *Sajina* (*hyperanthera moringa*) bark and root.
 Salicylate of soda.
 Sanguinaria canadensis.
 Scilla.
 Scoparii cacumina.
 Senecio
 Senega polygala
 † Strychnine
 Tanacetum vulgare (*tansy*)
 Tin + NaSO₄ + K-Silicate amalgam
 Turpentine
 Veratrum alb. et viride.
 Wormwood
 Yew leaves (*taxas baccata*).

Also very big doses of :—

1. *Cathartic purgatives*—specially those that induce pelvic congestion or violent peristalsis (aloes, colocynth, croton oil, elaterin, gamboge, magnesium or sodium sulphate)
2. *Emetics*.
3. *Hæmatinics* (iron, arsenic).
4. *Stimulating diuretics* that increase renal congestion.
5. *Poisons* in general.

(B) By mechanical means :

I. General violence like—

1. Jumping or *falling* from heights.
2. *Throwing* oneself downstairs or down the stairs.
3. *Very hot* foot or hip or general (Turkish) *bath*.
4. *Blood-letting* (by leeching foot, vulva or anus.)
5. *Hard rides* or walks over rough roads
6. Violent *exertions* &c.

II. Local violence like—

1. THOSE ON ABDOMINAL WALL, SO AS TO DETACH THE PLACENTA : (a) *Too tight bandaging* or lacing of abdomen, or wearing of corsets ; or, (b) *Kneading* the abdomen ; or, (c) *Dealing violent blows* on it.

2. (i) INTRODUCTION INTO OS, OR UTERINE BODY (through membranes or between them and uterine wall) of irritating or inflammation-producing substances, like—(a) *Twigs* (6" to 8" long) of—*Akanda* (calotropis gigantea vel procera), *Apang* (achyranthes aspera), *Lankaseej* (euphorbium tirucalli, milk bush) *Lal chitra* (plumbago rosea) and

(b) *Roots* of—*Sweet karabi* (nerium odorum) *Kalika-phool* (oleander), *Chitra*, (Plumbago Zeylanica)—with or without a smearing on them of asafœtida.

(c) *Sticks* dressed up with rag or cotton-wool and soaked with *Juice* of—*Akanda*, *Bhela*, (Dhobie's Nuts) *rath*, (Jequirity)

Ghrita Kumari (Aloes Indica) *Madar*, *Calotropis procera* *Sajina* with croton oil.

(d) *Poisons* :—Arsenic (white and yellow) red lead. [Occasionally, the stick is withdrawn after smearing the drugs by their help, over the cervix. Sometimes, these twigs or roots transfix the uterine walls, projecting into peritoneal cavity ; and wherever the root, twig, juice or metallic poison happens to lie, it excites violent inflammation.]

(ii) INTRODUCTION INTO VAGINA—in the form of paste, one or more of the above irritant juices or poisons or of belladonna as suppository.

3. INTRODUCTION OF INSTRUMENTS aseptically for detaching placenta or puncturing the membranes or dilating the os, e.g. tupelo tents or sea-tangle tents, knitting needle, crochet needle, umbrella-rib, catheter-stylet, tampon, colpeurynter, bougie, metal sounds, Barnes' bag, Champetier de Ribes' bag, Hegar's or Champonniere's dilators.

4. VAGINAL INJECTIONS OF—acid sulphuric or carbolic, strong solution of hydrarg. perchlorid, Condyl's fluid, decoc. belladonna leaves. [Frequent and forcible injections of very hot water or water at 95° F is often effective].

5. POWERFUL ELECTRICAL DISCHARGES between the os and fundus uteri.

Genital Signs of Abortion : [Look for—(a) Bruises on abdominal wall, (b) presence of foreign bodies in vagina, (c) injuries to the genitals, and (d) signs of recent delivery]. Always examine within 24 hours.

I. In later months : Those of delivery at term.

II. In early months of pregnancy :

1. **In first or second month** :—Perhaps only severe hæmorrhage for a day or two, which may be mistaken for discharge of copious menses. [Examine discharge microscopically.]

2. In 3rd or 4th month (=signs of recent delivery) :—

- (a) *Vulva*—bruised. *Vagina*—patulous and bleeding.
- (b) *Os*—feels softened, relaxed and admits a finger.
- (c) *Uterus* is larger than normal ; its walls are thick.
- (d) *Abdominal walls and Breasts*—relaxed.

Post Mortem Examination

I. Of Mother : Look for presence of—

1. POISONS (chiefly irritating) in *stomach, intestines, kidneys*.

2. Signs of PREGNANCY and recent DELIVERY.—Examine ovaries for *corpora lutea*, uterus for *decidua*, site of *placental* attachment the last being apparent about the 3rd month), &c.

3. Signs of LOCAL VIOLENCE or MANIPULATIONS : (a) *corrosions*, or other *injuries* in uterus or vagina (b) presence of *peritonitis* and of *septicæmia*. [CAUTION : Ordinarily, soon after delivery, the interior of uterus is black, rough in appearance and debris of *decidua* are found here and there. In case of mechanical injuries, these appearances are strictly localized and accentuated at one spot only].

II. Of Embryo —Note specially (a) Its age (b) Its viability (c) Possibility of its live birth (d) Signs of injuries on its body—whether they are ante mortem to post mortem.

Medico-legal points :

1. **Abortion & Instrumental delivery.**—Skillful aseptic drainage of the liquor amnii or introduction of styles, bags, sounds and dilators will completely empty the uterus, and if done without hurry, there will be no trace of injury. A pregnant woman herself, unaided, may successfully puncture the membranes or otherwise deliver herself instrumentally ; but, anxiety to finish the job, even in skilled hands, leads to punctures into

or lacerations of cervix, uterus and vagina, which tell their tale. Remember, that *even in skilled hands*, in some cases, such injuries may occur ; hence, examine all wounds very carefully as to the possible mode of their causation. As a rule, labour follows emptying the bag of waters within 50 to 60 hours, though an early period of 10 hours and a late one of a week are on record. Rupture of membranes, itself a sure means of emptying the uterus, is not a necessary condition when METALLIC SOUNDS etc., are introduced without draining the waters—the uterus emptying just as surely as if the membranes were punctured.

2. **Indian Law** makes it penal to *cause* or *aiding* to cause miscarriage, whether it be with *consent* or *without* consent of the woman ; but the consent of the mother mitigates the offence. In English law, consent does not condone the offence, the *intention* of the perpetrator is quite enough, no matter whether the woman is pregnant or not, whether the operation succeeds or fails, whether any injury is caused or not.

3. **Usual times for Abortion.**—(a) **Natural** abortion occurs usually between 3rd and 6th weeks and the tendency to abortion exists until the uterus has risen above the pelvis (3rd to 4th months) (a) **Criminal** abortion is induced between 3rd and 6th months.

4. **The signs of abortion depend on**—(a) *Health* of the woman : the more vigorous her health is, the quicker the repair and the less marked are the signs. (b) *The duration of pregnancy* : the longer it is, the better marked the signs are. (c) *The method employed and the skill exercised to procure it* : the more natural the course followed, the less marked are the signs. (d) *Time that has elapsed between abortion and medical examination* : the longer it is, the marked are signs.

5. Almost the same signs that occur during *menstrual period*, simulate the signs of abortion, viz., bloody discharge,

patulous os, congested sodden state of uterus, with thickened mucous membrane.

6. **Proof of criminal abortion** is very difficult. All a medical man can say is that the uterus has been emptied--but not positively. Injuries to genitals should be examined once for all, with a view to ascertaining the possible modes of their causation. Remember also that irritants are thrust into vagina, not only to procure abortion but also to punish or torture for infidelity.

7. Women are sometimes by habit or disease, **prone to abortion** : and, in them, almost any thing helps to empty the uterus ; on the other hand, in others, there is no limit to what their pregnant uterus can *successfully endure* ; hence, unless there is a predisposing tendency to abortion, not one or more of **the several means employed** to procure abortion is *certain* (not even quinine and ergot), except the mechanical ones. Injections, electrical shocks and aseptic artificial induction of labour do not leave any trace of crime. All these artificial means are risky to mother and child alike. The risk is in hæmorrhage and sepsis.

8. While most of the so-called **abortifacient drugs** are reputed to act on uterus, few of them act on it while pregnant. **ERGOT** and **STRYCHNINE** have little action on quiescent uterus. specially so, the less advanced the pregnancy. So also probably **QUININE**, in the presence of malaria. Eden thinks that 'Ergot in any dose is unable to transform the contractions characteristic of pregnancy into contractions characteristic of labour.'

9. **Abortion is justified** by a qualified medical practitioner [I. P. C. § 312] if induced in good faith to save the woman's life. It should be done (a) with patient's (written) consent,

(b) in agreement with a specialist or a colleague. The *chief indications* for its induction are—excessive vomiting, phthisis, insanity, heart disease—caused or aggravated by pregnancy; local obstruction to delivery, hæmorrhages, rupture of uterus &c. [“Therapeutic abortion.”] Premature labour for this purpose, may be induced at *any period of pregnancy*; but if convenient, it should be held back till *viable* period, so as to give the child a chance of living.

10. No **privilege** attaches to statements made to a medical practitioner by his patient in regard to causing miscarriage; a request to effect it or the disclosure of the name of some one else who is likely to do it, or has done it, should be reported to police. But, so long as the attending medical man does nothing which may assist the patient in escaping from or defeating the ends of justice, no offence attaches to him for the simple fact of his attending on a patient who has had miscarriage criminally effected on her, or of not breaking the silence concerning his patient.

11. **Pregnancy** is no bar to any **operation**, either on vagina, vulva, bladder or urethra; and except sharp hæmorrhage, there is little to fear in local operations.

12. **Unintentional Abortion.** The physician is often the victim of a deceitful woman, who appears with a well-concocted history of her case which does not, in the least, suggest the possibility of pregnancy; he may be induced to **pass the uterine sound**, and unless it be an inordinately healthy uterus, with unlimited capacity for mending injuries done by such instrumental interference, abortion is inevitable. If, in all so-called gynæcological cases, care is taken to *inspect the breasts* (for the classical signs) *before the sound is put in*, or a *local application is ordered*, all such possibility will be reduced to a minimum.

(G) RAPE or DEFLORATION.

Definition : 'Rape'—is the carnal knowledge, by a male adult, of any woman, (1) who is *under 12* years of age, or (2) who is aged *above 12* years, but who is *unwilling* to the act, or whose *consent* is not free and voluntary and honestly obtained.

Medico-legal points :

1. **In Indian law,** (1) Mere *vulval* (not even vaginal) *penetration* is rape (with or without violence or emission of semen, or of rupture of hymen). (2) Law admits the *testimony* of victim, and does not stop to enquire if the raped woman be married or not, girl or woman, chaste or unchaste ; hence, question of *consent* is important under all circumstances. (3) If a *woman compels a boy* (under 11 years) to have intercourse with her, that is *not* rape, according to Indian law, but is rape according to French law, for *copulation* and *masturbation* are not unlawful acts.

2. **Medical evidence of Rape**—is derived from (a) marks of *violence* on the female's *body* and *genitals* ; (b) presence of *blood*, *semen*, mud, dirt &c. in the genitals or cloth of the female ; and (c) existence of *gonorrhœa* or *syphilis* in either the assailant or the woman or both. [CAUTIONS :—(a) Veneral Infection is commonly the result of rape ; but a healthy girl can infect herself by using the sponge, towels or clothes &c. of another already suffering from the poison. (b) Since, according to law, mere *vulval* penetration is rape, presence or absence of semen (spermatozoa) does not prove or disprove rape. Besides, semen may be found in a woman's VAGINA (specially in its lower part) without any penetration having occurred ; for, it can be artificially deposited there by the woman herself. (c) Presence of semen on *male's* CLOTHES does not prove rape ;

on woman's clothes, may be owing to consent ; but on female children's clothes it is suspicious. Not all semen contain spermatozoa.]

3. **Rape and consciousness.**—(a) *Complete* sexual act can be committed on a woman, accustomed to sexual intercourse, without her being aware of it, during hyponotic sleep, or unnaturally heavy sleep or post-epileptic *coma*, during drug *narcosis*, *cataplexy*, *hysteria* &c. but hardly ever possible during her *natural* sleep. [A woman, remember, cannot be hypnotised against her will, though she can be paralysed by extreme terror]. (b) Rape by vulval penetration only, can be committed even on a virgin during natural sleep without awakening her. *Complete sexual act* during *natural* sleep is *impossible* in a *virgin*.

4. **Anaesthetics and Rape.**—(a) Speaking generally, one cannot be rendered *instantly* senseless by drugs against one's will, not even by nitrous oxide gas or, by a non-fatal dose of any drug. It is impossible to *chloroform* a woman single-handed, against her will and never before 2 to 10 minutes have elapsed. Only, in exceptional cases, it is possible to chloroform during fainting fit or sleep. (b) Anæsthetics stimulate the sexual functions and the ano-genital region is the last to give up sensitiveness ; further, during drug-narcotism, hallucination of rape may occur, especially, if the women are excitable and be then menstruating or pregnant. Such sexual excitements are remembered after recovery from anæsthesia and are believed to be real events. Chloral, opium, cannabis indica, alcohol and dhatura never render one unconscious *immediately* ; also, it is hard to drug a woman against her will—all these drugs having characteristic smell and taste. Hence, in cases of alleged stupefying by drugs or anaesthetics or hypnotism, enquire about the woman's previous character.

5. **Pregnancy may follow rape, and is independent of volition, orgasm and of complete penetration.**

6. Rape may be followed by—(a) *Severe inflammation* of the genitals. [Severe injuries to genitals have been known to have been caused wilfully and even with the consent of the woman, by other means than rape, in order to get somebody else into trouble under that false charge.] (b) *Convulsions*. (c) *Epilepsy*. (d) *Loss of consciousness*. (e) *Melancholia*. (f) *Insanity* etc.

7. Rape may cause death (a) *primarily*—from shock, or hæmorrhage (b) *Secondarily*—from gangrene, sloughing, peritonitis etc.

8. An able-bodied young man, single-handed, can effect “vulval penetration” into the body of a healthy, young woman, but a “complete sexual act” is unlikely. The absence of evidence of resistance on the part of a victim of undoubted character, indicates one of two things : (a) the woman was rendered *insensible* or was *paralysed by fear* ; or (b) she was a *consenting* party, although subsequently, she may appear as injured innocence. (c) Children have been *gagged* with clothes or with mud thrown into their mouth—some having *died* in consequence. Hence—

- (a) (COMPARATIVELY) EXAMINE THE WOMAN—as regards her age, health, strength, physique, occupation, and knowledge of how to use strength,—to determine if her resistance was frustrated. [A child naturally offers little resistance and may have no marks of injury.]
- (b) DETERMINE IF sudden stroke STUNNED the woman ; or if she was overpowered with TERROR or horror at her situation or was subjected to threats of death or duress. CAUTION.—There may be marks of violence about the pudendum or on the person and yet the

conduct of the woman assaulted may have been such as to imply consent on her part. (b) A woman may not have been touched at all, and yet, with a view to extort money or to get somebody into trouble, she may inflict on her person marks of violence. Those produced by a ravisher are often from above downwards; those self inflicted in an opposite direction. See p. 110.

- (c) EXAMINE THE SCENE OF OCCURRENCE, and consider the circumstances, & marks of violence on their person.

9. **Hymen.**—(a) *At the first coitus*, it is torn, specially at the posterior part, into 2 or 3 portions: this is practically bloodlessly done,—but in some cases fatal bleeding may occur. (b) The cicatrized nodules remaining of the hymen *after delivery* are called *caruncula myrtiformes*. [CAUTIONS.—(a) A *denticulate or fimbriated* hymen has been often mistaken for a torn hymen. (b) *In children*, the hymen is placed far into the back and hence, it escapes tear in rapes. (c) A hymen may be so *tough and yielding* as to remain intact and lend itself to fruitful coitus through a small aperture on it. (d) Hymenal rupture once produced never reunites. (e) In the absence of semen or pus inside vagina, while injuries to hymen, if accompanied with other local signs of violence, go in favour of rape, the absence of injuries to hymen and genitals, specially in any adult female habituated to sexual intercourse, goes against rape. See pp. 375 and 377.]

10. Unless severe, **local evidence of rape disappears**. In married women, commencing within 48 hours, they disappear before 4 days and *in virgins*, within a week or more. So, *late* reports of rape and findings of dilatation etc. of vagina are often suspicious. In England, no prosecution can lie after 3 months. Enquire, if she is *menstruating* now, or was menstruating then?

11. Discharge from vagina may be *due to* :—(a) **CRIMINAL VIOLENCE**.—In such a case,—it is not very copious and there are signs of inflammation invariably present to account for it. (b) **LEUCORRHOEA**.—Here, there are inflammatory signs, discharge is *mucous* in character, or, muco-purulent, if attended with ulceration. (c) **THREAD WORMS**,—for which examine anus. Such girls are *dirty* and of *scrofulous* habit of body. (d) **GONORRHOEA** :—Discharge is profuse, and purulent, with gonococci ; discharge appears between the 4th and 8th days, lasts longer and does not readily yield to treatment. (e) **VAGINITIS**—found in dirty eczematous children, infected with thread worms. It is purulent and yields to treatment quickly.

12. Venereal infection.—A *purulent* discharge cannot appear within 24 hours of connexion, nor can any venereal sore appear suddenly. The **incubation periods of**—(a) *gonorrhœa*—some hours to 12 days ; (b) *simple chancre*—3 to 5 days ; (c) *venereal chancre*—15 to 40 days or more ; and of (d) *condylomata*—1½—3 months. A man infected with venereals does *not* necessarily, by coitus, communicate it to victim, though usually, he does it, in the new soil of a healthy vagina, or through the ulcerated surfaces on a child's body.

13. Motive for rape.—Besides *lust*, rape on children is often the outcome of a *superstitious belief* that venereal diseases are cured by coitus with virgins.

(A) Examination of a living raped woman.* Take *written* notes of the following (before witnesses) :—

1. Enquiries :

- (a) *Date* and exact *hour* she visits you or you, her.
[In the latter case, visit without giving notice.] How many hours is the visit, since occurrence ? Why *late* ?

* The points that should be established to bring home a charge of rape are : (a) Signs of defloration ; (b) Signs of infection of the female ; (c) Signs of injury to the body generally and (d) Signs of seminal fluid or blood on clothes or person.

- (b) Her *age* : Is she above 12 years of age ? [consent]
- (c) The *dress* she wears and *the manner of its wearing*.
- (d) Her *walk* : Is she *intoxicated* or *in pain* ?
- (e) Her *health* and *physique*.
- (f) Her *mental state* : Is she emotional ? or intoxicated ?
What are her *feelings* towards the accused ?
- (g) *Who are with her*, and what are their attitude and
frame of mind towards the victim and accused ?

II. Statements.—Take down (*separately* and in the *exact* words used) the statements of her and her friends. [Note, if she is speaking under compulsion.] Note—

1. As to (i) her *age*, (ii) *date, time*, and *place* of occurrence : was it a place frequented by persons or by the accused ? (iii) Exact *position* and *posture* of the parties during assault (iv) Did she *cry out* or *struggle* ? If so, what ? Is she physically able to cope with assailant ? (v) Was she *menstruating* or not at the time ? (vi) Was she *sensible*, throughout the assault ? (vii) What were her *gestures* and *motion* after the assault ?

2. *Symptoms* she complains of.

III. Marks of struggle on her body.—Examine specially Face, Lips (inner and outer aspects), Neck (front), Shoulder, Chest, Wrist, Arms, Back and Buttocks. [Could any of them be *self-inflicted* ? (See p. 110) Struggle is marked in adult women and absent in children, they having fainted through pain or fright ; or bruises on face and lips are all that may be found.]

IV. Examine her private parts*—even if she be *menstruating*.—See below for “Genital Signs of Rape.” *Do not readily swallow her story*, but judge for yourself, if any or all the wounds could have been caused otherwise than as suggested by the woman.

* Never yourself strip her ; never examine her without her free consent.

V. Examine her clothes,—(i) as she is wearing them, then, and (ii) after having her undressed, for—(a) *Signs of struggle* :—See if you can accurately fit in the tears and stains with the bruised parts. (b) *Stains of blood, semen or gonorrhœal pus, dirt &c.*—Notice if such parts of dress are near genitals. (See p. 114)

VI Examine Stains for—(1) human blood, (2) spermatozoa, (3) gonococci, spirochitæ pallida (syphilis) &c., (4) menstrual blood. (See p. 109.) [Never diagnose semen, unless an entire spermatozoon is clearly seen.]

Examination of the male assailant.—[*Obtain consent.* Record his *statements* and judge how far they agree with your findings.

I. Note *date, exact time, name.*

II. (a) Ascertain *age* (p. 54).—Is he under 7 or 12 years? (b) Examine his *mental condition* : Is he *sane*? Is he *excited*? (c) Note his *size, physique and muscularity*. Is he capable of the act single-handed? (d) Is he *potent*? [A small or partially mutilated penis does not cause impotence] (e) Does he suffer from *venereal troubles*? If so, of what nature?

III. **Signs of Struggle.**—Look for : (a) *Injuries* about face and other parts of body : e. g., unrooting of *hairs* or *beard*. (b) *Blood* on clothes and under *finger-nails* [Note shape and condition of under part of *finger nails*] (c) *Bites* about hands &c. (d) *Torn* or *disordered clothes*.

IV. **Signs of recent intercourse***—as denoted by—

(a) Absence of *smegma* on *glans*. [This may be due also to a wash.]

(b) Presence of *finger-nail-dents* on *genitals*, and abrasion of *frænum* [May be caused also by *masturbating*.]

* Never yourself strip examinee; always obtain free consent.

- (c) Signs of *Satyriasis*—if examined immediately after the act; but, if examined soon after,—Penis is *he* and *excitable*, with glairy whitish *discharges* on glans and in meatus.
- (d) Presence of *hairs* (other than his), *blood* &c. on penis, scrotum, pubis &c. [(i) Blood may be absent if assailant suddenly withdrew after having caused laceration, from victim's screaming out from pain (ii) By semen or blood, hair gets matted together.]
- (e) Presence of *gonorrhoea* or *venereal sores*—contracted from the raped woman.

(B) Autopsy on a woman raped to death—

- (a) **Examine** :—(i) MOUTH—for foreign bodies; and in GENITALS—for signs of rape or of recent delivery [Presence of semen proves intercourse only.]
- (b) **Consider**—(i) whether the signs are *ante mortem* or *post mortem*; (ii) whether they are *sufficient to cause death*; and (iii) whether signs of violence received otherwise and on other parts of the body may account for the death.

Note : (i) *Children are first raped and then murdered* *adult women are first murdered and then raped.* (ii) See p. 38. (iii) "Fatal hæmorrhage into brain and peritoneal cavity may take place from shock in young girls about the age of puberty".

Genital Signs of Rape* in the female :—

(A) In Adult Virgins (upto, say, 16 years of age) :—

* (I) They vary with (a) amount of *violence* or *resistance* offered (b) *time elapsed since assault*; (c) *disparity of age and physique* and (d) *virginity (intact hymen) or habit of sexual intercourse* (II) In the total absence of local signs, give a guarded opinion (III) **State only**—how certain injuries found could have been caused—by the human member or other physical means. (IV) **Noma** (=sloughing from diphtheria, enteric, variola &c. or dirt condition in *scrofulous, ill-nourished* young female children) often simulate rape with violence.

I. IF SEEN SOON AFTER INTERCOURSE*: —

Breasts—no change. [In the absence of impregnation, breasts undergo no change, even in habitual intercourse. They are, however, flabby in masturbators.]

Pubic hairs—‘matted together,’ by semen, blood or pus.

Clitoris—tender and slightly enlarged.

Vulva :—Bruised, bleeding or inflamed. Hence, pain (lasting 1 or 2 days) is felt on walking, micturition, defæcation or on separating thighs. [Vulval injury is absent in children.]

Vagina—hot, tender, lacerated, gaping; in it may be blood clot, semen, or even muco-pus.

Hymen†—is (a) torn in its posterior part, if the woman consented; (b) destroyed, along with the mucous membrane of vagina and vulva, if the woman resisted. Tears are sharp-edged, fresh-looking, bleeding, swollen, and tender. [*Remember* that the hymen is not torn in child virgins.]

Fourchette—is (a) ruptured, if much violence was offered; and (b) uninjured, if the woman was a consenting party.

II. IF SEEN ONE OR TWO DAYS AFTER :—

(a) No fresh hæmorrhage has been going on.

* *All* these signs may be present after a first *marital* connexion—except signs of force and violence !

† Resume of the state of hymen in cases of rape :—

<i>In</i>		<i>If not much violence used</i>	<i>If much violence used.</i>
Virgins {	Under 10 yrs.	Intact	Torn
	Over 10 yrs.	Torn	Torn
Non- Virgins {	Non-parous	(gone ?)	(gone ?)
	Parous.	(gone)	(gone)

While an intact, soft hymen is positive proof of absence of vaginal penetration, absence of hymen is no proof of want of virginity.

(b) Inflammation, purulent or sero-purulent discharge (gonorrhoeal?) which stiffens the linen worn, is present.

(c) Pain in walking, defæcation and micturition is gone.

III. IF SEEN 5 OR 6 DAYS AFTER :—

(a) *Inflammation*—has subsided.

(b) Scanty serous *discharge*—is present.

(c) Sharp tears in *hymen*—have, probably, healed and rounded off, though they are tender, swollen and red in colour.

(B) In Child Virgins (8 years or under) :—

I. IF MUCH LOCAL VIOLENCE HAS NOT BEEN USED :—

(a) *Labia majora et minora*—may be bruised and swollen (or not). About, but not in, the external genitals, blood stains may be present ; or there may be none.

(b) *Hymen*—not ruptured ; it is perhaps only congested.

(c) *Pain* is felt—in micturition, defæcation or walking or separating the thighs. (It lasts 8—14 days.)

II. IF MUCH LOCAL VIOLENCE HAS BEEN USED :

1. *Vulva*—deeply lacerated, extensively bruised, and bleeding.

2. *Vagina*—shows (a) complete tear, perhaps opening into peritoneal cavity ; and (b) crescent-shaped laceration—only, if fingers have been previously introduced into vagina, to dilate it.

3. *Posterior commissure*—ruptured ; *perineum* may be completely torn through.

(C) In Married Women—If suffocated, narcotized or held down cleverly by many, there will be *no* sign of general violence ; but, there *may* or *may not be* signs of *local* violence, because, in married women, habituated to sexual intercourse, a mere separation of the thighs causes dilatation enough of the vulva to admit the male organ with ease.

VIRGINITY.

Definition.—It is an undefiled condition of the female genitals, due to want of carnal knowledge or sexual indulgence. The best proof of virginity is—an *intact condition of hymen*.

Questions arise, (1) in *divorce* or *defamation* cases, where it is doubtful, whether sexual intercourse has taken place or not ; (2) where, to extort *compensation*, a menstruating woman falsely accuses a man of having *raped* her ; or, (3) where serious disease or injury to the female genitals has been caused, calling for applicability or otherwise of *Contagious Diseases Act*.

The **normal hymen**—is a circular membrane, usually with a central aperture and more or less irregular margins.

Fallacies : (1) Besides—(a) the frequency of *false* accusations for rape, and (b) the *wilful injury* of female genitals made to support a false charge, **all real virgins do not have an intact hymen**.

(2) It may be **congenitally absent**, *perforated* or *incomplete*.

(3) It may be **ruptured**—(a) by *accidents*, from riding on horse-back, fall on hard projections &c. ; (b) by *masturbating* with big objects (hard or soft) ; masturbators, as a rule, however, confine themselves to the clitoris and parts anterior to the hymen ; (c) by surgeon's *examining fingers* ; and (d) by *blood clots* during menstruation. It is not likely to be ruptured by mere fall with thighs separated. It is surgically possible (but not probable) completely to heal the hymenal tears.

(4) It may be **destroyed** by ulceration or suppuration.

(5) In adult virgins, the hymen may be **tough and yielding** ; In them, (a) introduction of male organ causes no *injuries* ; (b) *immoral life* is possible with so-called signs of virginity ; and (c) *intercourse*, through a small aperture may be *fruitful*.

(6) **In children**, the hymen is *tough* and *deeply situated*, and, as, during intercourse with children, there is hardly any

vaginal penetration, hymen may *not* be ruptured, unless unnecessary *violence* is used—in which latter case, extensive lacerations occur. On the other hand, in girl prostitutes, who are made to *artificially dilate their vagina* with sola or tent, penetration of penis (if not too voluminous) is possible, without causing local injury.

Signs of Virginity :—

Virginal characteristics.

Labia Majora—well-developed, firm, elastic, touching each other.

Vulval orifice—closed.

Nymphae—not visible ; pink, uniform in size, with unindented borders.

Hymen—in tact (See above)

Clitoris—small.

Vagina—narrow rugose, its opening is slit-like.

Fourchette—is intact and crescent-shaped.

Breasts—hemispherical, elastic, plump. Nipples are small and circular, surrounded by rosy or dark brown areola.

Non-virginal characteristics.

Labia Majora—not touching each other and relaxed.

Vulval orifice—gaping.

Protrude between labia, bluish or pigmented, unevenly elongated or lobulated.

Ruptured or lacerated or lax.

Somewhat larger.

Rugose, and its opening looks like—H.

Is ruptured.

Flabby, and large. Nipples are large.

UNNATURAL SEXUAL OFFENCES.

I. MASTURBATION or ONANISM.

Law does not punish onanism or copulation.

Causation :—faulty *education*, *neurotic* family-history, lascivious or immoral *surroundings*, excessive meat or highly-seasoned *dietary*, the presence of *thread-worms*, *pruritus* about genitals, acrid vaginal *discharges* (as in the case of Messalina and

Agrippina.) It is **common** in men as well as in women, specially when young, in boarding schools, hostels, bagnios, ship-board, garrisons and jails and the habit is **contagious**. The victims vie with each other in discovering new and attractive methods of sexual stimulation and now and again the further perverted instinct grows of *inflicting wounds* upon themselves and upon each other, during the act. [Compare—Lesbian love or Saphism among females.]

Signs and Symptoms (vague) : **PSYCHICAL** :—slowness of *thought* and *comprehension*, *timidity* in conversation, morbid quickness of *feeling*, wretched *self-introspection*, love of *solitude*. **PHYSICAL** :—*Eyes* are sunken, *countenance* is haggard, look downcast and timid, *hands* moist, cold and dank, dark patches under *eyes*. **DISEASES** :—short *sleep* ; *marasmus* and *wasting*, *nervous* diseases, *indigestion*, *spermatorrhoea*, nocturnal emissions (wet-dreams), frequent *micturition*, redness of *meatal orifice*, a sense of weight in rectum, prostate, perinæum and testes, irritability of bladder, smallness and tenderness of testicles.

II. SODOMY or BUGGERY : PÆDERASTY.

Definitions : (1) **Sodomy**=anal coitus with an *adult* human being. (2) **Pæderasty**=anal coitus with a *boy*. (3) An **active** agent in any of these is one who performs the act, and the person on whom it is performed, is the **passive** agent. He is also called—succubus, bote, androgynus, cinædus, anandreis, mujerado, pathic, catamite, ingle or burdach. (4) **Tribadism** (or Lesbian love) is mutual sexual intercourse between two women. An elongated clitoris may be present in one or both and Caspar believes that this practice is common in Parisian prisons and female hospitals.

Causes :—Indulgence is due to :—(a) *enforced abstinence*, coupled with great sexual desire ; (b) these being a means

of *stimulating sexual power* in those who are partially impotent ; (c) severe *mental disease* (senile dementia, brain-softening of the insane) in which an inversion of sexual instinct occurs ; and to (d) *congenital* contrary sexual instinct.

Medico legal points. (1) The **natural sexual instinct** in human beings is to the *opposite* sex ; even the worst debauch does not deviate from it. Hence, instances of *unnatural* sexual instinct denote *perverse mentality*. (2) There are two classes of castrated males (**eunuchs**) in India, the *khojas* (who guard the harem) and *hijras* who are *professional passive sodomites*. These latter dress themselves as females and swell their ranks by castrating children by making a clean sweep of the whole external genitals, and they seek the society of males. (3) **According to Law**, (I. P. C. § 377)—(a) *penetration* alone has to be proved ; (b) *both* active and passive agents are punishable, in spite of mutual consent. (4) **In medically examining persons**,* note—(a) mental development, (b) age, (c) condition both of anus (passive role) and of penis (active role) and (d) potency. [*Always examine with consent.*] (5) Anal coitus is impossible without *consent* or during *sleep*. Usually, one and the same person, is, in turn, both the active and passive agent. *Oral* coitus is not sodomy. Though English Law mentions *anal* coitus specifically, Indian Law makes it a crime to use *any* bodily orifice.

Symptoms & Signs :

I. In Recent Cases.

1. IF NO FORCE HAS BEEN USED :—

(a) *In Passive Agent* : No signs externally ; semen and pus are found inside *anus*.

* It is impossible to testify with certainty to acts of sodomy, even in chronic cases ; presence of chancre and gonorrhoea, in or about anus, is corroborative.

(b) *In Active Agent* :—Penis smells of, or may be smeared with, foeces.

2. IF FORCE HAS BEEN USED : (a) *In the Passive Agent* :
Sphinter ani—stretched, bleeding lacerated, fissured.
 (∴ *defæcation* and *walking*—are painful)

Anus—is painful, excoriated, with a triangular wound,* whose base is external and sides retreat into the funnel-shaped anal skin; or, anus may be prolapsed; or, it may show venereals. *Semen, blood* or *pus*—is found inside anus, or on clothes.

(b) *In Active Agent*—Penis is foeces-smeared and smells of it.

II. In Chronic, Habitual or Confirmed Cases.

(a) IN THE ACTIVE AGENT :

Scrotum—is relaxed and pendulous.

Penis—is constricted, elongated, relaxed (pendulous) :
urethra is sometimes twisted; *Glans*—is more conical and bulbous. *Syphilis* or *Gonorrhoea*—may be present.

(b) IN THE PASSIVE AGENT :

Buttocks—are excessively developed.

Skin about anus—is not puckered, but shows a characteristic triangular wound, is smooth and funnel-shaped, tapering towards the anus [so it is in the emaciated also !]

Anus—is pushed up and deeply-placed; is gaping; its *sphincter* is relaxed, through which, the thickened mucous membrane may protrude (hence, inability to retain foeces). There may be *old scars* (syphilitic) about the sphincter and

* "Penetration seldom reaches beyond 1" and the force expends itself on the lowermost semilunar fold, which, in the empty gut, droops on either side....Hence. the wound is triangular: *the triangular shape of the wound is characteristic and it cannot be produced by any hard substance*". (W. J. Johnstone)

muco-purulent *discharge* (gonorrhœa). Piles, fistula, *syphilis*, *stricture* of rectum may also be present.

III. BESTIALITY.

Definition :—Intercourse with an *animal*. Domestic *fowls* too have been used for such purposes. Most often, it is the *male* that enjoys the animals (male or female) ; but a *female* may use a male animal for the purpose and thereby sustain *excoriations* and other signs of rape on her person. The *signs on the animal* are similar to those of rape or sodomy—without, but oftener with, the man's *semen* in the animal's vagina or rectum ; (*b*) *on the man* : as most animals are hairy, under the microscope, hair of the animal may be looked for under the prepuce. **Practised by**—(*a*) *mentally weak* individuals or (*b*) by sane men under the *delusion* that such acts cure venereal trouble in them.

IV. INDECENT EXPOSURE OR EXHIBITION.

Individuals indulging in indecent exposure of their organs, are found generally to **suffer from**—senile dementia, general paralysis of the insane, alcoholism or from rickets or other constitutional trouble (while young) or epilepsy. Medical men may have to testify to the *mental condition* of these men. According to English law, this offence is punishable if committed by *men*, but not punishable if committed by *women*.

V. CRIME & BIZARRE SEXUAL ACTS.

In an individual of normal mentality, ejaculation and emission of semen yield sexual gratification ; but, in **MORAL PERVERTS** (whose will is weak, who hardly possess altruistic sentiments or whose sexual instinct is of perverted nature, wherein gratification is sought by eccentric means, *even at the expense of another's happiness or life itself*), no action of venery,

directly connected with or referable to the sexual organs, yields any gratification. In them, acts of **cruelty** or of **monstrosity**, which the *sense of subjugation of self or of victim* underlies, serve as *equivalents* of sexual act—with or without ejaculation or emission of semen at the crux of such cruel or eccentric acts ! Hence, such bizarre sexual acts lead to crime or murder : religion, lust and cruelties are thus oftentimes mixed up
Examples :—

(1) Rakes sometimes have themselves **flagellated** or **pricked**, *until blood flows*, just before the sexual act, in order to stimulate their diminished sexual power ! (2) **Sadists**—who are sexually hyperæsthetic, satisfy their lust, by committing crimes, like *murdering* the woman, *sucking her blood* (vampires ?), *mutilating female corpses* (necrophiles), *stabbing* or *whipping* women with whom, for the time being, they are living in order to *enjoy sight of blood*—all these act as the equivalent of coitus. The sadist (called after Marquis de Sade), is dominated at once by a thirst for power, lust and cruelty, wants *complete subjugation* of his VICTIM (woman, boy or animal), on whom these acts of cruelty supply the enjoyment of a coitus. There are women sadists too, who want complete subjugation of the man (2) **Masochists** (called after Sacher-Masoch) are the opposite of Sadists : they seek **SELF**-subjugation ; they seek abuse, punishment and humiliation (by disgusting acts) of themselves *by the opposite sex*, as a means of exciting libido and satisfaction of lust. (3) **Fetichism** is the association of lust with the idea of certain portions of the female *person* (hand, feet, sweat etc.) or articles of female *attire* (gloves, handkerchief, etc.). This frequently leads to unaccountable *thefts* of articles of female dress or *despoiling of female hair*. (4) **Homosexuality** or contrary sexual instinct—where there is complete *absence* of *sexual* feeling for the *opposite sex*, with substitution

of sexual feeling and instinct for the same sex. According to degrees of development of this instinct, a man may suffer from (a) *eviration* (i.e., assumed inclinations and feelings of a female), or (b) mental (not physical) *transmutatio sexus* or a *delusion* of transformation of sex for purposes of enjoyment during congress; (c) *horror* for the opposite sex, etc. These males, who feel like women towards men are called **urnings**. They indulge in various aberrant sexual indulgences. (5). **Cunnilingus**, **fellare**, **frottage**, **mixoscopia**, **irrumare**—are other aberrant sexual acts, associated with unnatural mentality.

Responsibility.—The congenital *idiots* and *imbeciles* often murderously attack their own relations and openly indulge in disgusting sexual acts. Those who are *demented* (specially from epilepsy, head injury &c.) have periodical irresistible impulse for sexual vice, to perform which, they may commit murder or other crimes. *Periodic insanity* from menstrual troubles also leads to periodic lustfulness of a loathsome character. *Satyriasis* (in males) or *nymphomania* or *utero-mania* (in females)—is hallucinatory insanity—although these can also be due to pure physical causes (e.g., pruritus, oxyuris, ingestion of cantharides &c.) *Persecutory Paranoia* also is responsible for other vices. **Law**—should therefore consider not the nature of the crime, but the instincts and feelings of the *perpetrator*, his past history, his present condition and look for *periodicity*, *senility*, *silliness*, *perversity*, or *cruelty* in him and if the acts were done *openly*.

CHAPTER XI.

INSANITY.

(A) GENERAL CONSIDERATIONS.

Synonyms. Mental aberration; Alienism; Mental derangement or disorder; Lunacy*; Madness; Psychiatry.

Definition. *Insanity* is such derangement of the leading functions of *thought, feeling and will* (together or separately) as disables a person from thinking, feeling and acting (*i.e.*, possessing the highest *control*) in respect of *himself* and his *surroundings*, like men of his *own race, time and age* and like *what he himself behaved*, before being ill. ["It is a disease of the *mind* and not of the brain. It is associated with symptoms of *bodily affection*, overshadowed by those of the *mind*." We must be *general* in our pathology and cease to locate the mind in the skull.]

"In the eye of law, however, (a) insanity (which is essentially a legal distinction) is a disorder of the *intellect*, resulting in incapacity or irresponsibility." (b) *After the age of 12*, every man is assumed to be sane, unless proof to the contrary is forthcoming. (c) The ONUS OF PROOF of insanity, including its extent and degree, rests on the person who alleges it.

* **Lunacy** denotes that form of insanity which is characterized by periods of entire cessation of mental derangement (or *lucid intervals*). **Madness**—is insanity characterized by *excitement*.

General Introduction.—

The great nerve centres in a normally constituted individual, are :—

<i>Name of Centre.</i>	<i>Its situation.</i>	<i>Normal functions.</i>
I. IDEA TION- AL (Primary)	<i>Grey matter of the convolutions of the hemispheres of brain</i>	<ol style="list-style-type: none"> 1. <i>Feeling</i>, including conscience (moral sense), emotions, instinct. 2. <i>Knowing</i>, including memory, ideation, perception, imagination, judgment, reasoning. 3. <i>Willing</i> or volition including instinct, conduct, habits.
II. SENSORY (Second ary)	Collection of <i>grey matter</i> situated between the decussation of the pyramids and floor of lateral ventricles of <i>brain</i> .	Perception of sensations
III. REFLEX (Tertiary)	<i>Grey matter of spinal cord.</i>	Conversion of sense-impressions into motor or secretory actions.
IV. ORGANIC	<i>Sympathetic ganglionic system</i>	Metabolic activity

Brain is (a) the *vehicle* of all that is forthcoming in human character—of all energy that travels towards it; (b) the *retentive organ* of all facts about animal and other ancestral experiences that drop into it (but never off it); and (c) the *specialized* head quarters of sensations and notions which are manifested as conduct. **Mind**—is the result of *very* slow evolution of the nerve-tissues, through various processes of integration and through various actions and reactions of the *environment*. **Consciousness** is the *subjective* manifestation of complex reactions to stimuli. **The lower animal's consciousness** of itself, in relation to other things, is, firstly, *visceral* or *nutritional*—i. e., it pays over-attention to its bodily wants; then it is *predatory* or *fugitive* (in relation of

offence and defence); then it is *constructive*, then *domestic*. **Early man** passed through similar phases, until he became *constructive*, *domestic*, *self-regarding* and finally *speculative*.

But brain is not the sole organ of mind. Though mental states are doubtless dependent on the activity of the nervous system, **the mind possesses a certain amount of autonomy.** [Mind means all the phenomena that centre round consciousness;—but consciousness is not mind—it represents, after all, what we 'see' of mind. Mind in fact may be (a) *Conscious*—the disease of which causes insanity; (b) *Subconscious*, which works during hypnotism; and (c) *Unconscious*—which is a powerful every-day factor in disease and therapeutics—disease of this produces hysteria.] IN A NEW-BORN BABY, there is a nervous system, but no mind. The baby grows in succession,—*sensation, memory, understanding, judgment*—thereby establishing mental relation with its environments. The more the relation grows, the better is the **development of the mind**, by *differentiation* and *integration* of parts and functions—realizing and keeping up unity in plurality.

In this process, **brain cortex** * plays the chief part. By means of its numerous *collaterals* and their branches, and the *psychical* or *associative centres*, brain cell *associates* and *directs* excitations carried to it from peripheral cells; and, as every polydynamic cortical cell is both an organ of reception and of discharge, the cortical cell *intensifies* the excitation or stimulus by conjunction and union with the dynamic forces arising from hundred other cells set in action by the nerve-elements first excited; thus, the brain cell *associates*, sorts, sits in judgment upon present impressions, compares them with others that have preceded them and retains them in the

* The cortex does not grow by its cells but by the dependencies of the cells, *v.z.*, the *collaterals* and *distal terminations of the axones*. The matrix for the reception of different impressions is accordingly preformed, ready to *receive* the conducted impulses from special sense organs; but the *elaboration* of these impressions only comes at a time after the association tracts have developed to a sufficient extent to allow their excitations to be correlated.

The activity of the nervous system is in direct proportion to its *blood supply* (in respect both of *quantity* and *quality*.)

cell-memory for present and future service. [Complicated *mental* processes are not always explicable as *brain* processes].

Of all hereditary diseases, insanity is the most hereditary : the man of to-day is the sum-total of the habits, vices, defects, virtues of his progenitors for hundreds of years. Educationists, physicians, politicians and sociologists have been the chief artisans in moulding the human mind as it is represented to-day. Formerly, a man accused of any crime had to be totally delirious or fatuous to be absolved from punishment ; but now, the power of controlling his actions is being gradually made the test.

Insanity is *reversal of evolution*, and, as such, has its beginnings in the latest evolved (∴ least stable) structures and functions of brain. As the moral sense is the highest attribute of the mind, and the last to develop, it is the first to suffer in disease and the last to be restored ; and, an individual affected by it, is otherwise intelligent, but he fails to view his acts from the normal standpoint. [Herein lies the difficulty of medical men]. A man therefore, is said to be insane, when, compared with his *own* mind, he is found to deviate from it, and, our measure of insanity is the observed reaction of the individual in relation to his *environments*.

Age and Brain development.—From birth to 17 years of age, is the period of *growth* and development of brain ; from 17th to 24th year, is the period of *development* of brain, without growth. From 10th to 14th years, *memory* is stronger than at any other period of life. The tangential fibres (the fibres of association in the brain) increase considerably between 16th month and 33rd year, and, during this period, the brain increases in *size* and *weight*. *Association* between cortical cells lasts till the most advanced age.

Circumstances calling for Medical Opinion :

(a) A really sane man may adopt the plea of insanity to escape the consequences of his acts ; or (b) a man of really unsound mind may commit a crime, for which law does not hold him responsible, but is bound to give protection to those injured

thereby. Hence, the mental condition has to be medically testified to, when questions come up,—

(a) In Criminal Courts, regarding*—

1. DETENTION IN ASYLUM of an insane person. [Lunacy Act of 1912]. Is he fit to live in society or in asylum? Is he *un-social* or *anti-social*?

2. A person's being mentally so incapacitated as not to understand his RESPONSIBILITY in respect of *acts of violence* or *crime* committed by him. [I. P. C. § 84, and expl. 3].

3. Validity of CONSENT *e.g.*, to have sexual intercourse, or to have an operation done. [I. P. C. §§ 87, 90, 300 expl. 5, 305, 306.]

4. Capacity TO MAKE A DEFENCE in Court. [Cr. P. C. 464, 465].

(b) In Civil Courts, regarding—

5. Validity of CONTRACTS (*e.g.*, marriage, which, excepting among Hindus, is a contract). [Act 9 of 1872, § 12.] [4 Exch. 7].

6. TESTAMENTARY CAPACITY—*i.e.*, capacity for making a will, realizing (while doing so), (a) the *nature* of the act; (b) the *consequences* thereof; (c) the *extent* of his property; (d) the lawful *claims* of those interested in his property; and (e) *meaning* of every term used by him in the document. [*Eccentricity* per se, does not invalidate a will.]

7. Competency as a WITNESS [I. E. A. §§ 118, 119].

8. Capacity TO MANAGE ONE'S AFFAIRS [Acts 34, 35 of 1858]. (a) Complete amentia, dementia, general intellectual

* Insanity of drunkenness, feebleness of mind, epileptic insanity, paranoia and general paralysis of the insane—chiefly give rise to crimes.

mania,—completely incapacitate an individual from managing his affairs; (*b*) in partial intellectual mania, capacity depends on delusion; (*c*) in moral mania, capacity remains; (*d*) defective memory from old age or aphasia per se is no incapacity.

9. Awarding COMPENSATIONS in cases where mental unsoundness follows closely upon *an injury to the head*—the two being related to each other as effect and cause.

Classification of Insanity.

A. CONGENITAL = *arrest* of normal development of mind
= Amentia or Dementia Naturalis.

I. *Locally* endemic and complete = CRETINISM.

II. *Non-Local Amentia* :

1. Complete = IDIOCY.

2. Partial = (*a*) IMBECILITY { Moral.
Intellectual.

(*b*) WEAK-MINDEDNESS.

B. ACQUIRED *perversion* of normal mental standard.

I. Mania (or Raving Madness) = Excessive *object*-attention.

1. *Simple*.

2. *Acute or Typical*.

3. *Chronic* : *Recurrent, Periodic or Epochal*.

4. *Moral or Affective*.

(*a*) General = IMPULSIVE OR EMOTIONAL INSANITY
(with instinctive propensity to commit crime).

(*b*) Partial (with OBSESSIONAL IMPULSE) *e. g.*, *Disposomania, Erotomania, Homicidal mania, Kleptomania, Pyromania &c.*

5. *Intellectual or Ideational.*

(a) General.

- | | | |
|--|---|--|
| (i) Acute delirious
(non-melancholic) | { | (a) Bell's mania
(b) During fever, blood-poisoning, drug habit. |
|--|---|--|

(ii) Melancholic = **LYPEMANIA**.

(b) Partial.

- i. **MONOMANIA or CHRONIC DELUSIONAL INSANITY or PARANOIA.**
 - ii. **HYPOCHONDRIA.**
 - iii. **CIRCULAR or ALTERNATING.**
- II. **Melancholia (psychalgia) :—**(a) Simple, Delusional, Hypochondriacal ; (b) Agitated, Stuporous, Homicidal, Resis-tive, Partial.
- III. **Stupor** (including **HYPNOTISM, SOMNAMBULISM, CATALEPSY**) :—Simple, Melancholic, Delusional.
- IV. **Dementia or Fatuity** [= *Visceral super-consciousness*]
1. *Senile.*
 2. *Primary*, from masturbation. (**DEMENTIA PRÆCOX**).
 3. *Secondary* (from syphilis, sunstroke, apoplexy, epilepsy &c.)
 4. *Paralytic* : **GENERAL PARALYSIS OF THE INSANE.**

London College of Physicians Classification.

Insanity of Early de- velopment.	{	<i>Idiocy</i> —from (a) brain deficiency, (b) sense deficiency, (c) inability to develop. <i>Imbecility</i> —from inability to develop fully.
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Insanity of Childhood (under 10).	{	<i>Mania</i> <i>Melancholia</i> <i>Moral Perversion</i>	{	from congenital causes, epilepsy, injury or brain disease.
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London College of Physicians Classification—(Contd.)

Insanity of Adolescence (10 to 20 years)	$\left\{ \begin{array}{l} \text{Mania—with conceit} \\ \text{Emotional melancholia and hypochondriasis (with liability to recurrence and mental weakness).} \end{array} \right.$	
Insanity of Maturity.	$\left\{ \begin{array}{l} \text{Mania} \\ \text{Melancholia} \\ \text{Dementia} \\ \text{General Paralysis (from strain or excesses).} \end{array} \right.$	
Insanity of Climacteric.	$\left\{ \begin{array}{l} \text{In Women} \\ \text{In Men—} \end{array} \right.$	$\left\{ \begin{array}{l} \text{Delusions} \\ \text{'Persecutions'} \\ \text{Hallucinations} \\ \text{Hypochondria.} \end{array} \right.$
Insanity of old Age.	$\left\{ \begin{array}{l} \text{Mania} \\ \text{Melancholia} \\ \text{Dementia} \end{array} \right.$	All tend to dementia.

Causes of Insanity=instability, derangement or degeneration of nervous system :—

(A.) Predisposing Causes (chiefly Physical).

I. LOCAL :

(i) **ARREST OF DEVELOPMENT OF BRAIN**—(a) *per se* ; or (b) from interference with growth of skull (as in cretinism).*

(ii) **DISEASES OF, OR INJURIES TO, BRAIN OR HEAD** :—(a) *Tumour, softening or abscess* of brain. (b) *Inflammation* of brain and its meninges. (c) *Cardiac* diseases or aneurysm producing cerebral passive congestion. (d) *Epilepsy*. (e) *Tabes*. (f) *Sunstroke*. (g) *Disseminated Sclerosis*. (h) *Bulbar paralysis*.

II. GENERAL.

I. INHERITED TAINT † from parents, predecessors or

* Artificially binding the head in an infant results in microcephaly and ossification of the fontanelle and thus prevents development of brain. [Defective development of cerebellum leads to deficient co-ordination of muscles].

† Inherited taint may declare itself as a *neurosis* in one generation and as a typical insanity in the next.

collaterals, who suffered from any of these diseases, *viz.*, apoplexy, chorea, asthma, migraine, neuralgias, epilepsy, hysteria, alcoholism, criminality, bulbar palsy, cerebral diplegia, softening or tumour, disseminated sclerosis, paralysis agitans, eccentricities, infantile paralysis, one-sided genius.

2. CONSTITUTIONAL DISEASES—

- (a) *Diatheses of insanity, gout, rheumatism.*
- (c) *Stunted development of body* ; consanguineous marriage, specially between neuropathic parents.
- (d) *Wasting diseases or conditions* : (i) born of old parents ; (ii) preconceptional sexual excesses on the part of parents ; (iii) starvation, malnutrition ; (iv) diabetes, phthisis ; (v) masturbational excesses, * over-education with insufficient hygiene ; (vi) lactation, menopause.

3. PHYSICAL IRRITATIONS OR STRONG IMPULSES, involving or not, sudden and severe nutritive derangements :—

- (a) *Changes of*—puberty, † adolescence, menopause, senility.
- (b) *Pregnancy, parturition, excessive lactation.*
- (c) *Painful cardiac, uterine or ovarian disorders* ; irritation from *worms, prostatic disease or stricture, floating kidneys.*
- (d) *Starvation, excesses, dissipation.*

* Masturbation is a *cause* of insanity as well as a *symptom* of insanity of climactic and of old age. ["The *religious* and *sexual* sides of man's nature are both closely connected with the *emotional* development and are connected with his *organic* nature."]

† **Age incidence** : cretinism occurs in *youth* ; acquired insanity is rare before *puberty*, after which, dementia præcox is common ; primary dementias are rare after 40 ; so are exhaustion psychoses ; the idiopathic insanities, myxœdema, exophthalmic goitre, toxic insanities occur throughout life from *adolescence* ; paranoia occurs in *adult mature life*.

4. TOXINES :

- (a) *Endogenous* : exanthemata, exhausting fevers with much delirium or excitement, pneumonia, septicæmia ; chorea, myxoedema, cretinism, exophthalmic goitre ; uraemia ; sun-stroke, syphilis, phthisis, malaria, intestinal fermentations (dyspepsia, paradiagnosis, &c.)
- (b) *Exogenous* : Traumatism, Poisoning by alcohol, bromides, cannabis indica, dhatura, cocaine, chloral, opium (smoking), lead, mercury, ergot, fungus, pellagra-

(B.) Moral.

1. *Grief*, anxiety, worry, nervous shock, disappointments, sudden excitements, enforced celibacy.
2. *Overwork* and over-strain.
3. *Hypnotic* suggestions. 4. *Religious* excitement.
5. *Persuaded* insanity ; (a) Folie à Deux, (b) Folie à Plusieurs, Epidemic insanity.

(C.) **Exciting** (in those already predisposed).

1. Head *injuries*.
2. *Stress* of examination or of the three epochs of life.
3. *Sudden shock*. 4. Sexual excesses.

[*Remarks*—(a) Insanity is often **hereditary**, the pathological *characters* are not so much transmitted as is a predisposition to succumb to pathological *influence*. It is more frequently transmitted to and through the *female* than the male. Although, generally speaking, a different type of insanity is the result of heredity, certain types of insanity may be transmitted with greater ease than others (= similar heredity) e. g. periodic insanity, delusional insanity. (b) As for **fright**, children have been thoughtlessly stricken into dementia by say,

the sudden jump, from behind a door, of a concealed play-mate ; or startled into epilepsy by an unexpected scream. (c) Religious preaching by a fiery and fanatical preacher has thrust individuals into the outer darkness of confirmed melancholia.]

Symptoms of Insanity.

Onset—very gradual :

(A) Premonitory.

1. NERVOUS SYSTEM : (a) *Sleep*—is disturbed with dreams ; or, is lost ; or, is persistently heavy (b) *Muscular System (Energy)* : there is either oppressive lassitude (anergia) ; or, irritable restlessness, tremors, spasms, exaggerated reflexes. (c) *Sensation*—is rather acute, (d) *Knee jerk*—may be sluggish and *eye reflexes*—may be absent. (e) He gets unwarranted fears or strange beliefs. (f) *Habits* become altered. (g) He loses *self-control* and becomes *indecisive* ; begins to have imperative ideas (*obsessions*) and *impulses*. (h) He becomes *negligent* in conversation, business, dress, and in meals. (i) *Temper* becomes suddenly changed or capricious ; he becomes suddenly cruel, abusive, indecorous—all which were foreign to his nature. (j) He becomes unusually irritable and reckless in *conduct*. (k) *Attention* : is lost ; he cannot properly argue, judge, or produce anything by serial mental activity (l) *Memory* is lost, specially in its ethical sides.

2. DIGESTIVE SYSTEM : (a) *Appetite* is failing or lost. (b) *Digestion and assimilation* fail (hence, either surfeited, gross countenance or haggard, anæmic look). (c) *Constipation* and slight jaundice supervene (∴ headaches) (d) *Tongue*—coated.

3. CIRCULATORY SYSTEM : (a) *Hyper, or hypo-tension* ;

* IF IT IS A CHILD, it is *precocious*, a victim to *night-terrors*, subject to *convulsive fits* (from gripes, worms, dentition etc.) and to *explosive rages and caprices*.

(b) changes in *rhythm* ; (c) *stasis* (. . oedema, lividities &c. of extremities) ; (d) changes in *composition* of blood.

4. GENITO-URINARY SYSTEM : (a) *Menstruation*—disturbed. (b) *Sexual functions*—modified. (c) *Urinary secretion*—decreased ; occasionally, polyurea.

(B) Common manifestations* :

1. DELUSION is a false *judgment* of *objective* things, which cannot be accepted by people of the same class, education, race and period as the patient ; it is a mistaken belief in attributes ascribed to something that are not believed by sane people of the patient's class, education and race. If delusion is not removeable by reasoning or by presentation of facts, it is proof of insanity. [Delusions may be *fixed* or *evanescent*. Many delusions originate in dreams, but become fixed from constant brooding. Hallucinations supply the most frequent material out of which delusions are elaborated.] *Examples* :—Beliefs like—I am being poisoned ; I am God ; I have committed unpardonable sin ; a paræsthetic spot in the limb is filled with worms, &c. *Delusion is common in*—dementia, confusional, hysterical, pubescent, gestational, lactational and alcoholic insanity, general paralysis of the insane, hysteria, hypochondria, imbecility, katatonia, myxœdema, mono-maniac and melancholia.

2. HALLUCINATIONS = *subjective* perception of *non-existent* objects. They are perversions of *antecedent* psychic impressions, being perceptions *automatically* occasioned. They may be auditory, visual, tactile, gustatory, olfactory, sexual, visceral, oculomotor, locomotor, articulo-motor. *Examples* : (1) seeing

* Any person may be *INSANNE* without having any or all of these symptoms. Any *SANE* person may have illusions and hallucinations but he is able, with the evidence of his senses to correct his false impressions. Hallucinations. Illusion and Delusion are purely personal sensations.

pillars of fire ; (2) hearing voices or rustling ; (3) feeling sensations of flying ; (4) feeling stomach torn open. [REMARKS :—(a) Sense-deceptions that are not purely personal (as the perception of a stick half-immersed in water as broken, or duplication of an object looked at through prism) are not hallucinations.

(b) *Hallucinations often exercise unusual compulsion on the will.*

(c) Strained attention, exhaustion (as, just before sleep), artificial (as by electricity) or morbid (as by taking belladonna) stimulation, ordinary sense stimuli, prevention of ordinary sense-impressions (as during solitary confinement), hallucinations of other sense-impressions, and affective-conative conditions—all these help to promote the disposition to hallucinations. (d) If a man can be reasoned out of his false perception, he is not insane.]

Hallucinations are common in :—climacteric, lactational, rheumatic, pneumonic, persecutory or religious, delusional, acute confusional insanities ; middle-ear disease ; in aura of epilepsy, in poisoning by cinchona, ergot, conium, dhatura, alcohol, lead, delirium tremens, enteric fever, hydrophobia, myxœdema. Hallucinations of hearing, taste, smell and common sensibility are common in the chronic forms ; of sight, in the acute forms.

3. ILLUSION—is false sensory impression of a real object, the falsification of a peripheral sensation occurring either in the terminal apparatus (optical, auditory, gustatory or olfactory) or in the central organ after its arrival (= imperfect mentalization)

Examples : Seeing ghosts in the dark, where a shadow is ; imagining a rope as a snake ; sweet sensation on furred tongue of dyspepsia ; taking an inarticulate shout as a word of reproach ; a masturbator fancying that his body is smelling of semen.

Illusion occurs in—toxic or periodical insanity, hypochondriacal melancholia, mania, poisoning by belladonna, cocaine, alcohol. [This is no proof of insanity and is met with in those exhausted.]

4. **SUICIDAL, HOMICIDAL OR OTHER IMPERATIVE OR FIXED IDEAS.**

5. **MENTAL COMA**—in which every faculty is in complete abeyance, the most severe stimuli failing to rouse it.

6. Capability to endure severe physical privations and hardships—and even to stand big doses of drugs and poisons.

Procedure of examining alleged insanes :

[**Directions:**—(1) *Introduce yourself to patient as doctor.* (2) *Take written notes, verbatim, of the various conversations you have, questions you put, and answers you receive.* (3) *Do not cross-examine him or interrupt his talks.* (4) *Examine him repeatedly, for a long while each time, at all sorts of hours and without notice.* (5) *Do not be guided by the statements of others.* (6) *Direct your questions to all forms to insanity. In court, you may have to explain every step of your examination and the reasons for your opinion.]*

1. **Enquire about history** (1) **OF HEREDITARY TAINT**,—of, neurosis, crime, suicide, insanity, eccentricity, brain disease, epilepsy, syphilis, gout. Suicide by whom, at what age, by what means, under what circumstances? [Remember about *atavism*—i.e., recurrence of a morbid defect after a latency of one or more generations]. (2) **CONGENITAL DEFECTS**: micro or macro-cephaly, tumours, rickets. **Enquire about Personal**—(1) **NEUROPATHIC TENDENCY**, as manifested by (a) *Neuroses* (chorea, epilepsy, migraine, hypochondriasis, neurasthenia, neuralgia, hysteria) or by (b) *Temperaments* (eccentricity, melancholy, optimism). (2) **HABITS**: indulgence in intoxicants, excessive venery, &c. (4) **PREVIOUS ATTACKS**: (in chronological order): their nature, duration, symptoms. Had he any 'nervous' disease? (5) **MENTAL SHOCK OR WORRY**.—Was dentition, puberty or climacteric or puerperal period

marked by any changes in temper or by any fits ? (6) CHANGE IN FEELINGS, AFFECTIONS OR HABITS (7 MENTAL DEVELOPMENT (as a boy) specially in reference to his race, environment, station in life. What about his *memory* and *intellect* as a boy ? Was he irritable, impulsive, restless, vain, quarrelsome or passionate ? Had he any *bad habits* ?

II. Notice Somatic Stigmata (in congenital cases).
[*Beauty is foreign to the genius of a lunatic.*] These are :—

HEAD : [Measure the skull] (a) two sides *unequal* ; (b) Marked *flattening* of occiput or frontal bone (platycephaly) ; (c) Median line is raised like a *keel* ; (d) Vault *projecting* back and upwards ; (e) Extreme *brachycephaly* or *dolichocephaly* ; (f) General *disproportions* between vault and base. *Oxycephaly* (pointed head) is common among idiots and imbeciles ; *trigonocephaly* (broadened posterior regions) is common in imbeciles of all classes ; *leptocephaly* (narrowed frontal region and *plagiocephaly* (obliquity and projection forward of one half of the head) are rare ; *platycephaly* is common among epileptics. [Cautions :—(a) A skull whose circumference is below 17 inches, is incompatible with ordinary intelligence ; the average cubic capacity of the skull in the sane, is greater than in the insane individual. (b) Asymmetry of skull may also result from mal-nutrition, (rickets, syphilis &c.)

HAIRS : abnormally developed, *coarse* or *scanty*.

FOREHEAD : very *small* and *retreating*.

EARS : *pinnae* are either absent, mis-shapen, set too closely or project away from head, are implanted too high or too low ; *helix* is misshapen ; *lobule* bound down ; *tragus* wanting ; *Darwinian tubercle* is present ; *antehelix*, is unusually prominent.

EYES—Cataractous ; *retinal* and *pupillary sensibility* is

sluggish. Squint, high myopia, pterygium, coloboma, ptosis epicanthus, are present.

Nose—distorted, oblique, flattened or unduly prominent ; its *root* is unduly wide.

MOUTH—too small or too large ; with *harelip* or thick *lips*. *Hard palate*—is cleft, unnaturally low or highly arched, narrow, or small, irregular. *Soft palate*—is long, twisted to one side, pointed, bifid at the extremity or rudimentary. *Jaw* :—prognathus or small. *Teeth* :—1st dentition is delayed ; or overcrowded and decayed. *Tongue*—Large, with prominent papillæ. *Speech*—is stammering or stuttering. *Face* irregular as a whole or in its halves. *Tremors* (fibrillary)—are present in lips, tongue, face.

LIMBS : extra digits, talipes, unduly long arms, undue flattening of thenar and hypothenar eminences, spade-like hands are found.

THORAX—pigeon-breasted ; or funnel-shaped ; ribs rickety.

STATURE—diminutive or deformed. Retarded development of long bones. [Measure height and weight].

GAIT—is tripping-stumbling ; awkward at turning round.

SKIN—reveals naevi, leucoderma, anæsthesia &c., is harsh and dry.—Nails and hairs—brittle.

MUSCLES—flabby and weak. **SENSATION**—weak.

CIRCULATION, RESPIRATION, LIVER, and DIGESTION—sluggish.

SEXUAL FUNCTIONS—absent or perverted ; sexual **ORGANS**—undeveloped or malformed or abnormal.

III. Notice features, gestures, gait, appearance of eyes, general behaviour and dress with special reference to the points detailed under 'Feigned Insanity.'

IV. Examine the systems of body :—(1) **NERVOUS :** [*Exclude Diseases*, by noting if there be (a) alterations in pupillary reflexes, (b) optic neuritis, (c) speech anomalies, (d) disturbed innervation of facial and other muscles, (e) anæsthesias or paræsthesias, (f) altered reflexes, (g) state of sphincters. (ii) *Exclude Head injuries.*] (iii) *Examine motion, sensation* (general and of smell, taste, hearing, vision, and muscular, electric and thermal senses, *reflexes* (superficial and deep), *metabolism, nutrition, sleep* (and dreams). (iv) Test his mental capacity and condition, by his *handwriting, speech, will, memory, judgment*, powers of *reasoning* and *attention* ; and (v) go into his *moral* and *ethical* standards and see if he is *emotional*, or has *delusions*. (2) **CIRCULATORY :** Examine *pulse* (all available *arteries of body*) and the *cardiac sounds*. Look for *hematoma auris*. (3) **GENITO-URINARY :** Examine *his urine*—specially for casts, albumin, sugar, acetone, etherial sulphates, indol, skatol. (4) **DIGESTIVE :**—Examine specially appetite, *tongue* and *stools*. [All acutely insane persons look ill and lose flesh much.] (5) **TEMPERATURE** of body.

Diagnosis : From—

1. **Eccentricity :** In this, the *intellectual* faculties are not perverted.

2. **Delirium**—which (a) is the *result* of some other acute inflammation (pneumonia etc.) ; (b) is *coeval with* the duration of the causative disease ; (c) *disappears* suddenly ; (d) is accompanied by *fever* ; and (e) leaves the *senses* acute. [Insanity may complicate fevers and inflammations (as pyretic delirium tremens, acute rheumatic insanity, purperal insanity) and fevers and inflammations may complicate insanity].

3. **Intoxications** (alcoholic etc.)—which are *transitory* in nature and possess *characteristic symptoms*.

4. **Meningitis** (cerebral)—which is accompanied by—*headache, vomiting, intolerance of light and sound, contracted pupils, hard pulse.*

5. **Aphasia**—which is accompanied by *paralysis, understanding-faculty remaining unimpaired.*

6. **Feigned** vs. **True Insanity**

Emotional expression—not characteristic. Expression is characteristic. Eyes are vacant.

Does not *look* ill, nor *lose flesh* and does not need to be fed by tube. *Looks* ill, *loses flesh*, refuses food and \therefore has to be fed by tube.

'*Stigmata*,' frequent *pulse*, furred *tongue*, flushed or pallid *countenance*, injected conjunctivæ are—absent. All these may be present.

Pretends not to be *diverted* by this or that. Can be diverted.

Attacks are *sudden*; *Family history* is negative; no *prodromata*; *motives* are present. Attacks generally gradual. *Family history* and *prodromata* present. Motive not traceable.

Symptoms are not of any type but patient appears acutely maniacal, with pretended total loss of memory in everything. Of one distinct type. May be melancholic &c. He does not appear insane in everything.

Sleeps at night from exhaustion. A dose of *opium* strongly acts on him. Is sleepless, boisterous, particularly at night. Opium may fail to have any effect.

Is obtrusive as to *exhibition* of symptoms and *delusion*; and *declares* he is insane, instead of being indignant at suggestion of his being mad.. Indifferent as to *exhibitions*; reticent about *delusions*, indignant at *suggestions* of insanity.

Is not *emotional* on any subject. Is *emotional* while on his favourite subject.

Diagnosis from clinical manifestations :—

Patient does not answer questions.

- A. *He is very loquacious and his language is utterly incoherent* = Acute delirium ; Transitory Mania a potu ; Epileptic insanity ; Melancholic frenzy.
- B. *He mutters or uses isolated words or phrases habitually but cannot answer questions* = Idiocy ; Melancholia ; Dementia.
- C. *Facial expression is bland* = Kata-tonia ; Anergic Stupor ; Stupor-ous or Periodical Melancholia
- D. *Facial expression is ecstatic or intelligent* = Delusional insanity ; Amenomania.
- E. *Facial expression is anxious or terrified* = Stuporous melancholia.
- F. *He makes inarticulate noises and cannot speak* = Idiocy ; Terminal dementia.

(From James Shaw.)

Patient answers questions

CANNOT SUSTAIN CONVERSATION

- A. *Is absent minded, inert, forgetful* = Simple Primary Dementia ; Consecutive Insanity
- B. *Is a drunkard with tremors, nocturnal hallucinations* = Chronic Alcoholism or Alcoholic dementia.
- C. *Tremulous tongue, lips, face ; thick, stuttering speech, grandiose delusions* = G. P., Saturnine Psuedo G. P.
- D. *Memory, calculating power, knowledge-acquisition faculty are below par* = Idiocy, Imbecility
- E. *Following depression, agitation, delusions and peculiar pathos with cataleptic phases* = Kata-tonia (3rd Stage)
- F. *With emotional excitation, motor excitement, incoherence* = Acute mania ; Circular or Adolescent insanity ; Periodical or Puer-peral mania.
- G. *With extreme emotional depression, suicidal tendency and without motor excitement* = Melancholia
- H. *He answers irrelevantly confusedly or evasively* = Acute confusional Insanity

CAN SUSTAIN CONVERSATION

- A. *Has systematised, fixed, permanent delusions—but no marked emotional aberrations.* = Delusional Insanity (monomania, paranoïa), Chronic morphinism, consecutive Insanity.
- B. *Has unsystematised, fixed, permanent delusions, motor excitement, emotional excitation* = Chronic Mania, Chronic Hysterical Insanity.
- C. *Has no delusions, but has only morbid impulses* = Impulsive insanities.
- D. *Has no delusions ; but has only change of habits, disposition, demeanour* = Moral Insanity.
- E. *Change of habits with exaltation and ill-regulated conduct* = Simple Mania.
- F. *Change of habits, with depression* = Melancholia.
- G. *Given to doubting* = Folie de doute.

General lines of Treatment :

(A) Prophylactic :—

1. Start campaign against preventible causes—like *syphilis*, *drug habits* (alcohol, cocaine, cannabis indica &c), occupations requiring constant contact with *noxious substances* (Hg, CS₂, CO₂, Pb etc.), *head injuries*, *acute diseases* associated with rapid exhaustion (e.g., septicæmia), tuberculosis, rheumatism, altered blood-pressure (as in acute nephritis, gout, intestinal toxæmias.)

2. Combat prejudices that lead cases of insanity to be looked upon as *God's curse*, *witch's charm*, or *ghost-possession*—thereby preventing loss of valuable time in timely tackling the diseases.

3. Interdict marriages where—(a) one parent at least was *insane* (not of the purely exhaustion type) ; (b) *epilepsy* and *alcoholism* are united ; and (c) stock is *degenerated*.

4. In case of children,—

- (a) Ascertain and treat (i) any overlooked CARDIAC mischief ; or (ii) parental tuberculosis, gout or cancer, —in cases of children to be born.
- (b) Do *not* encourage their intellectual precocity, but rather—
- (c) Develop their PHYSIQUE, through quiet pursuits. Maintain BODY-WEIGHT a little above normal.
- (d) Grow in them a spirit of SELF-RESTRAINT and AVOID *sentimentality* and all manner of *excitements* and *stimulants*. Teach elementary hygiene.
- (e) Give them REST ; but AVOID—*idleness*, *pleasure-seeking*, his becoming a “society boy ;” avoid *novel-reading*, *religious fanaticism*, occupations requiring FATIGUE and avoid excesses of all kind (sleep fatigue, heat, cold etc.)

(f) Regarding their EDUCATION,

- (i) Place them in *special* schools for mentally backward boys, under special teachers, who can study and attend to *individual* student.
- (ii) Discard modern book-learning ; see that their lively *memory* or tricks of *imitation* do not cause one-sided development of their nervous system : develop their nervous system through *all* the *special* and *general* avenues of sensation and motion.

(g) DANGER SIGNALS OF APPROACHING MENTAL TROUBLE in them are : *Sleep*-lessness, loss of *appetite*, rising *pulse*-rate, falling *body-weight*, *mental* aberrations etc. [In all such incipient cases—(i) secure *rest* of body and mind at the earliest possible moment ; (ii) regulate *feeding* and increase the nutritive value of food ; (iii) secure *sleep* and regular action of *bowels*.]

(h) ADOPT PSYCHO-THERAPEUTICS (FREUD)=treatment by psychical means, of (i) juvenile depravity ; (ii) delinquencies in the young ; (iii) hysteria, psychasthenia, palsies, phobias, obsessions, tics, morbid doubtings ; (iv) paranoia, dementia præcox, manic-depressive insanity, melancholia. FREUD'S THEORY IS that every psycho-neurotic symptom is the *disguised* manifestation of *ungratified* fundamental instinct or desire—the repressed desires not having been destroyed, but allowed to gather force in the dark corners of the mind, constituting themselves, as it were, into quasi-independent “Submerged complexes” which unconsciously (or sub-consciously) influence our actions and impulses. Psycho-therapeutics lets in light upon these dark influences and by means of psycho-analysis, enables the patient to know better the workings of his mind, so as to be able to free his personality from

the constraining forces of these complexes. Psycho-analysis resolves itself into FIVE METHODS : (i) *Free Association*—between patient and doctor, the former cooperating unreservedly with the latter, in detailing his symptoms and main events of his whole life. (ii) *Word association*—i.e. the giving out of the very first word that suggests itself to the patient on hearing the doctor reciting separately a carefully selected list of words. (iii) *Dream Analysis*.—A dream, according to Freud, is not a confused and haphazard congeries of mental phenomena—but is the direct outcome of underlying latent but significant psychical processes. (iv) *Hypnosis*. (v) *Pulse-reaction*—on alluding to subjects connected with patient's repressed complexes.

- (i) Choose for such children a CAREER that is free from—(i) great responsibility ; (ii) difficult problems ; and (iii) rigid routine work.
- (j) Advise against MARRIAGE of such boys.

(B) Curative :—

1. **Take proper care** : have an efficient and vigilant nurse.
2. **Tone up the depressed system** : by (a) FOOD,—healthy, easily digestible, if necessary, predigested and well-minced specially, plenty of milk, cream, eggs, fruits and vegetables (except those containing much starch). [Cautions :—(a) *Meat* extracts and soups are allowable, but not to excess, especially in maniacs. (b) *Wines* are allowed freely, except in cases caused by organic brain diseases. (c) Do not, as a rule, use force ; if necessary, you may resort to nasal-feeding or nutrient enemata.]

(b) By MEDICINES.—After a preliminary *mercurial cathartic* (as most insane persons are jaundiced), give *tonics*—iron, manganese, arsenic ; phosphorus, strychnine, cod liver oil

glycerophosphates ; quinine, gentian, aloes ; belladonna etc. according to indications.

(c) By BATHS OR PACKS—varied as regards their temperature, duration &c., so as to suit each case. *Massage* is not usually called for.

(d) By AN OUTING IN OPEN-AIR, if it is possible for patient to bear it ; and by inducing him to take mild *exercise* or to take to pleasurable *occupations*.

3. **Do not give hypnotics**, if you can ; for, by over-doing it, you induce drug-toxæmia and lock up the natural secretions ; instead, try brandy and hot water at bed time. This failing, try—chloral, bromide, paraldehyde, methylal, trional, sulphonal, hyoscyamus, hyoscyne hydrobrom, cannabis indica, codeine phosph. [CAUTIONS : (a) Avoid *opiates*, if you can. (b) Do not give *Sulphonal* in melancholia, because it disturbs nitrogenous metabolism. (c) Study the *doses* of hypnotics necessary, instead of giving massive doses in routine fashion.]

4. **Treat symptomatically** : *If excited*, keep in circumstances in which the causes of excitement are at a minimum ; *if impulsive*, secure him against causing rash and dangerous acts.

5. **During Convalescence** (which is often prolonged) send patient to a quiet country-side, before allowing him to resume his usual work.

Prognosis : Idiopathic cases *often recur*. Dementia Præcox, Katatonia, Paranoia, Circular Insanity, Chronic Confusional insanity, Terminal Dementia, Doubting insanity, G. P., Idiocy, Periodical Insanity—are probably *never cured* completely.

Post Mortem Appearances : [There may be *none*].

Ear : *Hæmatoma auris* may be found.

Scalp : (1) Epicranial aponeurosis is *adherent* to pericranium (in G. P. and epilepsy). (2) Hypertrophy of *scalp*—which is .∴, disposed in antero-posterior folds and ridges.

Skull : (1) *Microcephaly*, (circumference=16·7"). (2) *Macro- or hydrocephaly*. (3) *Crania progenea*=lower jaw and forehead abnormally prominent, occipital region, ill-developed. (4) *Osteo-sclerosis or osteo-porosis* (in G. P.)=local or general thickenings. (5) *Atrophy*. (6) *Asymmetry*. (7) Absence or over-riding of the *dentary arcades*. (8) Deformities of *hard palate*.

Brain : (a) *Porencephaly*, (b) absence of *corpus callosum*, (c) atypical *arrangement* of convolutions and sulci, (d) absence or imperfect *development* of various parts of brain, (e) *heteropia* &c.

Cerebral Blood vessels : (1) *Degeneration* hyaline or fibroid) of tunica adventitia .∴, (2) obliteration of capillaries of first layer of cortex. (3) *Atheroma* or *acute periarteritis* of intracerebral arterioles. (4) *Endarteritis obliterans*. (5) *Miliary aneurysm*.

Dura Mater : (1) *Adhesions* to skull, or to arachnoid. (2) General *thickening*. (3) *Atrophic* thinning. (4) Formation of *bony nodules* in its substances (in parts adherent to falx). (5) Adhesion of subdural *false membranes* to under-surface of dura (not pia), with formation of occasional *cystic* centres.

Pia arachnoid : patches of *opacity* and *thickening*.

Neuroglia and mesoglia : (1) Hypertrophy and proliferation of *neuroglia* in certain places. (2) Proliferation or amyloid degeneration of *mesoglia*.

Cortical Nerve cells : "*Chromatolysis*, pigmentary or yellow globular *degeneration*, vacuolation, varicose atrophy of the *protoplasmic* processes, varicose atrophy of the *axis-cylinder* processes, displacement of *nucleus*."

- Focal lesions:** (1) Atrophic or haemorrhagic *softenings*; (2) Areas of *scleroses* (hypertrophic, nodular gliosis); or (3) *Tumours* (tubercular, syphilitic.)

Medico-legal points :

1. **Questions of insanity** arise in reference to (a) *particular act* or acts done or to be done by him or for him, and (b) to a *specified period of time*.

2. **Medically Examining for Insanity:** The medical witness must form opinion as to whether the person examined, was, *at the time* of doing the act in question, *incapable*, by reason of unsoundness of mind, of knowing the *nature* of the act or that he was doing what was otherwise *wrong* or *contrary to law*. [I. P. C. § 84] Acting on *facts* actually observed by him (and not from statements of others) the medical witness must be able to give *grounds* of the opinion he has formed and to testify, if the mental incapacity is to the *degree* specified.

3. **Legal Responsibility of Lunatics.**—In the eye of **LAW** (i) all sane persons are responsible for their acts; and (ii) all persons are sane, until the contrary is proved by those who allege insanity. But, speaking generally, though there are degrees of sanity, (iii) law does not appreciate them and aims at finding, if the victim, at the time of committing an offence, knew what he was doing (*i. e.*, had the power of controlling his actions). But speaking **MEDICALLY**, men may know right from wrong, and yet be insane. Thus,—(a) a person may *inherit* weak self-control or a painful constitutional malady that calls out impulsive outbursts; and the Calcutta High Court held, that a person subject to insane impulses, but whose cognitive faculties are not impaired, is not exempt from criminal liability (I. L. R., 23 Calc., 604); (b) *circumstances* in life may, by placing temptation within reach, lead to commission of crime.

4. **Temporary unsoundness of mind, following upon excessive drinking**, legally disqualifies a man from making a *contract* or gift, but does not absolve him from criminal *guilt*, if the drink was not administered to him without his knowledge or against his will. In fact, many a *murderer* gets himself *intoxicated* before killing his victim.

5. **Somnambulists** are not responsible for their acts : vivid dreams often continue their effect after the sleeper awakes, as in epileptics, somnambulists, &c., who acquire uncommon physical prowess at that time.

6. An insane man may have a **motive**, just as a sane man has. *Premeditation*, *cunning* and *prudent calculation* are not incompatible with insanity. Even in madness there may be *method* and *logic*.

7. Mad men are not always unfit **as witness**, because they are insane. Some of them are good observers and speak truth better.

Restraint of Insane Persons under Indian Lunacy Act, 1912 :—

I. Circumstances justifying it and the agents authorized to effect it :—

1. A person may **voluntarily** go into an Asylum [§ 4 (1), (2)] and thereby put himself under restraint.

2. **A relation of an insane person**, if the applicant is not a minor, may apply to a magistrate to keep in Asylum any relation of his (who is neither dangerous, nor unfit to be at large), provided, the applicant (a) gives in support, *two* medical certificates, *one* at least of which, is from a Government servant and (b) agrees to pay maintenance charge [§§ 5 (1), 7, 8, 10, 11 (b)].

3. Any **Inspector of Police** (or officer in charge of a police station) may arrest a lunatic *found wandering* or believed to be dangerous, and place him before a magistrate; the latter can put the lunatic into an asylum or under private care [§§ 13 (1), 14].

4. Any lunatic who is being (a) neglected, (b) *ill-treated* or (c) *not being properly controlled* by his natural guardian, may be put by a **magistrate** into an Asylum [§ 13 (2)].

5. On the report of a trying Court, any *accused* person *found insane in the course of trial*, may, by the **local government** be confined in an Asylum [Cr. P. C. §§ 466, 471].

6. Any person *acquitted* at a trial, on the ground that when he committed the offence, he was insane, may be detained by orders of **local government** in an Asylum.

7. Any person *in a jail*, found to be insane, may, by order of the **local government**, be removed to an Asylum [Prisoners' Act (1900) § 30].

8. Under army regulations, any administrative Medical officer may detain in asylum any lunatic **European soldier**.

9. Any **Indian soldier** found to be insane, is first discharged from his appointment and then admitted into an Asylum under precisely similar rules to his civil brother. [Act 11 of 1896 and Act 18 of 1894].

11. Discharge of Lunatics from Restraint is given—

(1) In the case of dangerous lunatics,—as soon as their *dangerous condition* disappears.

(2) On the *recommendation of the three Visitors* appointed [I. L. A. § 28 (1)], provided, that the lunatic is not—(a) an insane European soldier ; or (b) detained under Cr. P. C. § § 466, 471.

(3) On a responsible *relation's undertaking* to take charge of the patient (§ 33), provided that the officer in charge of the asylum does not consider the lunatic to be dangerous or unfit to be at large [§ 32 (1)].

III. Restraint in its Medical Aspects :—

(1) **ADMISSION INTO ASYLUM :—**(a) Unless it is impossible (for want of men, money or arrangements) to treat a case at home properly, *no case, for mere purposes of treatment*, should be sent to an Asylum. (b) *Children*—should not be sent to an

Asylum, for fear of being eternally dubbed as an ex-inmate of the Mad House. (c) *Cases dangerous* to themselves or to others or to the property of themselves or others, can be ordinarily sent to Asylum ; once admitted into an Asylum, the responsibility of the medical man who first ordered restraint, ceases.

(2) All PHYSICAL RESTRAINTS (in asylum) must be with the consent of guardian and should cease with the violence or dangerous condition of the patient. Restraints are, as a rule, necessary in—

(i) **Recent cases** of Insanity, also in delirium from diseases. These require *immediate* and *complete* control, because, under it alone,—(a) we can best study the extent to which patient's conduct is disordered ; (b) owing to enforced rest and isolation, the damage to the patient's bodily and mental health is easily restored ; and (c) he cannot injure himself.

(ii) (a) Where the condition of the mind is **infantile** ; (b) where the **instinct of self-preservation is absent** ; (c) where there is constant **homicidal or suicidal tendency** ;—*complete* control is necessary.

(iii) **When the acuteness has subsided**—after full restraint, and rest—allow liberty *tentatively* and *intermittently* at first ; and then, with as much gradually *increasing frequency* and *completeness*, as patient is able to re-educate his mental functions.

(iv) **Non-acute cases** : They require control *to the extent of the disorder* of the patient's conduct ; e.g., if patient is particularly incapable of managing his estate, to that extent only should he be controlled, being allowed full liberty in other matters ; if he is disordered in matters religious, domestic or of sexual relation, to that extent only, should he be controlled.

Civil Aspects of Insanity—Under Act 35 of 1858 (amended by Act 14 of 1870), a civil court can **make over the property of**

an insane person to the court of wards or to the district collector, after properly adjudicating the person to be really insane.

(B) AMENTIA (WEAK-MINDEDNESS.)

General characteristics :

(1) **Higher functions** : (a) *Perception, sensation* (∴ attention), *special sense* (∴ co-ordination, hearing, smell, taste)—are weak. (b) *Moral qualities* are very weak ; hence, they are cruel and delight in torturing animals. (c) Power of *speech, memory* (except occasionally, when it is predominant), *ideation, will*, hallucinations, illusions and delusions—are absent. (2) **Animal propensities** (gluttony, sexual excesses) and *impulsiveness*—predominate ; they are subject to fits of anger and of setting fire to objects. (3) **Physical Stigmata**—are present.

Causes (= ARREST of brain-development) :—(1) **PARENTAL** : (a) Insanity or neuroses ; consanguinity, syphilis, epilepsy or tuberculosis ; drug-habit &c. ; (b) Injury to, diseases of, or shock to, *pregnant mother*. (2) **INFANTILE** : (a) Asphyxia or compression of, or injury to, skull, *during parturition*. (b) High fever, convulsions, cretinism, malnutrition, mis-shapen skull.

Varieties (in decreasing order of mental evolution) :—

1. **Idiocy** :—*complete* want of mind ; it is associated with want of development of *sensation* too ; hence, patient is unable to learn or understand *anything*—even to walk, wash or eat. **CLASSIFICATION** : Idiots may be (a) Genetous—of Mongolian type of features, (b) Microcephalic—like Aztec race, (c) Eclampsic or Choreic, (d) Epileptic, (e) Hydrocephalic, (f) Myxœdematous, (g) Syphilitic, (h) Paralytic, (i) Traumatic, (j) Idiot by deprivation of one or more special senses, (k) Hypertrophic, (l) Progeria. According as the moral or intellectual faculties are specially and markedly absent, idiots are classified arbitrarily into MORAL and INTELLECTUAL idiots].

2. **Imbecility** = *Partial* *amentia* ; such a patient can understand or is capable of learning *only a bit*. He can talk and guard himself against common dangers of life, but is unable to earn for himself. **VARIETIES** : (a) **MORAL Imbecility**—is characterized by want of self-control and moral perversion ; hence, such individuals exhibit incorrigible *vicious* and *criminal* tendencies, though their memory, mental reaction and responsiveness are fairly good. They may have strong *fancies* too. (b) **INTELLECTUAL**—is characterized by want of general intellectual power in individuals who *can be educated* sufficiently to carry on work requiring little mental effort.

3. **Feeble-Mindedness**.—This is characterized by errors chiefly of *conduct*, rather than by deficient *understanding* and receptivity. Under favourable circumstances and with the help of others, they can manage their own affairs.

4. **Cretinism**—is *congenital* insanity, ASSOCIATED WITH (a) *goitre* in patient or parents, (b) with *pigmentation* of skin and (c) bodily weakness or deformity (dwarfing) and (d) *endemicity* in mountainous regions (below an altitude of 3000 ft.) rich with magnesium-limestone formations. [But all cretins have no goitre and all goitrous persons are not cretins.] It COMMENCES about the fifth month after birth. Their **PHYSIOGNOMY** : dwarfed stature, sallow complexion, coarse skin, irregular teeth. **SUB-CLASSES** are : (a) Cretins, (b) Semicretins, (c) Critinous.

[*Backwardness* is a condition to be sharply distinguished from mental deficiency.]

Treatment.

1. Build up the enfeebled constitution by liberal *dietary*, good *hygiene*, gentle *exercises* and *warmth*.
2. Patiently *educate* each according to the state of his mental development.

Pathology : (1) *Convulsions*—are rudimentary, simple, immature and incompletely developed. (2) *Pyramidal cortical cells*—are deficient in size, number and development. (3) *Neuroglial elements*—are increased and encroaching upon neuronie structures. (4) *Tumours*, areas of *softening*, *degeneration* or *traumatism* of areas—occur.

Prognosis.—It affects infants from or very soon after birth and often terminates in (a) *death*—from phthisis, epilepsy, asthenic complications ; (b) *non- or only limited-development of mind*. **Signs of bad omen** to mental development are : appearance of epilepsy, obesity, bodily deformities, squint, athetosis, 'stereotypy,' moral perversions, imperative ideas, excitements.

(C) MANIA.*

Introduction.—Volition or will, one of the three psychical manifestations of individuality, may be perverted from—(a) *want or deficiency of will*=IRRESOLUTION. Irresolution is due to (1) too many ideas crowding together, (2) weakness of motives, (3) doubt as to nature or result, (4) defects in mechanism of attention, and (5) toxic conditions. (b) Where this will to act is present, but there is inhibition to the *physical* translation of will into action, we call it 'ABOULIA.' (c) HYPERBOULIA is excessive impulsion to act—often suddenly. These are known as IMPULSES. These impulses are preceded by aura.

Mania and melancholia may co-exist, or alternate ; hence, probably, mania and melancholia are not of different pathological causation, but are stages in the progress of pathological processes, such as can be well followed in alcoholic intoxication. Note, that during prodromal stage in both mania and melancholia, it is melancholia that ushers in the condition.

Characterized by—(a) excessive *object-attention* (opposite

* It is—a phase of maniacal depressive insanity. "ACUTE MANIA may be (1) *the whole* of the disordered process ; (2) *part* of a complex form of insanity (e. g., in recurrent mania or folie circulaire) ; (3) *a symptom* of a more serious disease (as in G. P.) ; (4) *a concomitant* of epilepsy—following or replacing a fit ; (5) *the further development* of a delirium (due to fever or alcohol) ; (b) *a substitute* for some other neurosis (e. g., asthma or hysteria)".

of excessive self-regard), by (*b*) morbidly active *imagination*, (*c*) extensive loss of power of *correlation of ideas*, (*d*) hyper-excitability of *motor centres* of brain, and (*e*) periods of remission (which when complete = *lucid intervals*). *In spite of his violent antics, a maniac is always in a condition of exhaustion.*

Onset—usually gradual ; but may also be sudden.

Degrees or Varieties :—

I. SIMPLE MANIA.—**Synonyms :** Amenomania, Mania sine delirio, Partial Exaltation or Hypomania. **It is**—a psychoneurosis, **lasting**—for days or weeks. **It is characterized by**—
 (1) attacking chiefly *youths* on the brink of manhood,
 (2) persistent *gerrulity*, (3) impaired judgment and control,
 (4) constantly *changing* emotions, (5) fickle enthusiasm,
 (6) incapacity for any serial or sustained mental work, the mind becoming a prey to the suggestions environment affords.
 (7) *egotism, extravagance, desires for sexual and alcoholic excitement.* There are *no* hallucinations, delusions, loss of memory or of understanding faculty. [In bad cases, there occur—insomnia, muscular and sexual excitement and obscenity.] *To persons previously unacquainted, these patients appear as simply extravagant libertines and not as insane men (=Moral Insanity)*
Sequelæ : This usually passes off, leaving patient less intrinsically ethical and less receptive for external impressions ; or, it may pass into the “typical” form.

II. TYPICAL or ACUTE MANIA :

Onset—gradual or sudden.

Stages :—Premonitory Stage = physical and psychical **hebetude** (in those of *slow* onset).—furred tremulous *tongue*, lost *appetite*, disturbed *digestion*, constipation ; loss of strength ; decreased or increased *urine, eroticism*, amenorrhœa ; headache, *insomnia* with day-restlessness, melancholic brooding, altered

temper (specially, into self-conceit, misanthropy, suspicion, irritability, inattention), slightly raised *temperature*. This stage subsides gradually giving place to the next.

First Stage=Exaltation : *Digestion* improves, *depression* passes off, *health* betters, capacity for *work* increases, *memory* brightens, thoughts flow freely, *fantasies* crowd before his mental vision : there are unwonted garrulity, restlessness, *sexual* excesses and extravagance in *conduct*.

Second Stage=Furor or Frenzy=Stadium acutum=un-common *paroxysmal* prolixity of *speech* and *action*. (i) COMMON SENSIBILITY is sometimes obtunded (psychically), though there is a general *hyperæsthesia*. (ii) MOTOR ACTS are ceaseless, purposeless and uncontrolled ; each impression on the hyperæsthetic special and general senses calls forth activities,—before one action is complete, another action is started off. There are no paralyses, no rigidity ; most motorial activities are *destructive*. (iii) MENTAL FUNCTIONS : *Consciousness**—is confused. *Ideation* and *purposiveness*—are absent or confused. *Judgment*—may be unperverted. *Memory*—(past and present) is usually good ; but, may be lost to variable extent. *Speech* is voluble (logorrhœa) and incoherent to observers but not to patient ; it is often interspersed with or replaced by cries or shouts. *Conduct*—uncontrolled. There may be maniacal bent in one particular direction, with mental derangement. *Habits*—are cleanly but careless. Instinct of *self adornment*—is exaggerated. *Attention* and *Inhibition*—are rarely lost. *Answering questions*—is possible, but, before it can be completed, it is turned off, as the result of fresh sense-impres-

* **Consciousness** :—(a) In MANIA, it is merely *restricted* ; but in *Acute Mania*, it is altered, the individual having lost the identity of his self and environments in his insane imaginings. (b) In MELANCHOLIA, it is not *lost*, being centered in self. (c) In DEMENTIA—it is *diminished*. (d) In STUPOR—it is *suspended*.

sions, into another topic then uppermost in his mind. Fleeting *Delusions* of eroticism, religion or grandeur—are common. *Hallucinations* (visual, auditory etc.) are not frequent. *Murderous tendency now and again develops.*

(iv) ANIMAL FUNCTIONS are exalted: *Appetite* is voracious ∴, he eats to excess and indiscriminately. *Sleep*—is lost. *Sexual* impulses are excited (∴ nymphomania occurs in women and satyriasis in men), but *menses* are normal and *Breast Secretion* (in puerperal cases) is increased. (v) VITAL FUNCTIONS—are slightly stimulated: all the *secretions* are increased, *pulse* is quickened, *temperature* normal or slightly elevated, *breathing* normal. (vi) FACIES: *Eyes*, injected and staring. *Mouth*, wide open. *Head*, thrown back. *Face* flushed and wears the expressions of the dominant passion (anger, joy etc.) *Skin* hot and dry. *Carriage* erect (with general extension and abduction). *Fingers* spread out, *knees* straight.

Third Stage=Sullenness (*stadium debilitatis*).—*Excitement* abates; *headache* is persistent, patient may *sit muttering* to himself and going through all the manifestations of *impotent rage* and suddenly rushing out in murderous rage (= *Running amock*). DURING CONVALESCENCE, patient is somewhat stuporous, with hallucinations of hearing and analgesia of hands and forearms.

Diagnosis: Exclude—(1). **General Paralysis**—by exaggerated *knee-jerk*, *tremors*, difficulty in *articulation*, absence of the *pupillary* reaction to light. (2). **Psychoses** (of infection and exhaustion)—by confused *ideas*, lost *memory*, *hallucination*, *disorientation*. (3). **Dementia Præcox**—by *echopraxia*, *echolalia*, *stereotypy*, *verbigeration*, *seclusiveness*, *negativism*, *hallucinations* coexistent with good *perception* and *memory* and termination in *mental wreckage*. (4) **Epileptic Insanity**—by abrupt onset and offset with blank memory of the attack.

(5). **Delirium**—by want of coordination of mental functions and inhibition of motor activity. (6). **Meningism**—by strabismus, unequal pupils, retracted head, cerebral cry etc.

Prognosis : (1) *Recovery* with slight mental reduction. (2) *Recurrence* as *Chronic* mania, with hallucinations and fixed delusions. (3) Termination in *Secondary Paranoia*—with fair amount of intelligence and fixed delusions ; or, as (4) *Weak-mindedness, Monomania, Eccentricity, Moral perversion.* (5) *Death* from exhaustion. Their *wounds* heal marvellously ; they *resist sepsis*, but, if attacked with any disease, they either die speedily and suddenly or completely get over their mania,—the last one specially at menopause. If patient begins to fatten, the prognosis is bad. [A case lasts on an average, four to six months].

Treatment :

1. *If patient is exhausted*, keep him confined to bed. *If patient is robust*, send him into the country with active work, to expend his exuberant energies there ; and remove everything connected with the cause of his insanity.

2. *Purge* him every third day. *Feed* him copiously with extra doses of nourishing food, meat, wines and liquors,—if patient is badly prostrate. Tonics can be given only towards the end of an attack.

3. *Secure sleep*, by—prolonged (1 to 8 hours') hot *baths, cold compresses* to head, friction of body and extremities. *Hypnotics* should not usually be given in routine fashion ; if required, give only sulphonal, varied occasionally by paraldehyde.

4. *Prevent injuries* to himself and others.

III. **ACUTE or PRIMARY CONFUSIONAL (EXHAUSTION) INSANITY, Mania Hallucinata.**—It is a psychosis, characterized by (a) *confusion* of consciousness of surroundings,

(b) febrile disturbances, and (c) *prostration* (bodily and cardiovascular).

Causes : *Exhaustion* from : Exanthemata, insomnia, chronic gastro-intestinal disease, overlactation, delicate physique, shock, hæmorrhage, cachexias.

Prognosis—speedy death.

Varieties :

1. **Sub-acute :** SYMPTOMS :—(a) Benumbed *consciousness* of surroundings and befogged *mentality* : but, reflex and automatic mentality are intact. (b) Depressed *cardiac* and *gastro-intestinal* functions. (c) Rise of *temperature*. **PROGNOSIS :** favourable.

2. **Acute Delirious** = a psycho-somatic automatism or tornado. SYMPTOMS : (a) *Consciousness*—more or less clouded. *Memory* (associative)—failing. *Attention*—becomes impossible. *Delusions* (specially of identity, *illusions*, *hallucinations* and *obsession* of ideas—are present. Irrelevant, incoherent flight of *ideas* ; purposeless, tempestuous *activities* ; increased *reflexes* ; and constipation, nausea, foul breath—occur. *Temperature*—varies between 99·4 to 101·4 F. *General collapse* : cyanosis, oedema of extremities, feeble pulse, chilblains. **PROGNOSIS :** Recovery in 6 weeks to 6 months ; Lucid calm occasionally appears.

3. **Stuporous :** SYMPTOMS : Complete *disorientation*, total unimpressionability, patient lies motionless ; automatic *reflexes* dazed ; *eyes* move restlessly but unseen, *lips* mumble continuously ; face is drawn and pinched ; *temperature* is 105° F., *respiration*, panting ; *pulse*, feeble ; vomiting, diarrhoea present.

Diagnosis from : (1) **Acute Mania**—which is primarily and preeminently psychic, whose recurrent excitement is purposeful and objectful, attention keenly alert, and who is morally toneless. (2) **Dementia Præcox**—which is katatonic.

Treatment : Always treat in an Asylum, in a quiet part of the country. (1) Patient to be kept to bed, but avoid mechanical restraints and closely and carefully nurse him. (2) Overfeed him—so as to forestall otherwise inevitable collapse and cachexia. (3) Don't give purgatives—resort rather to enemata. (4) Look for and be prepared against collapse.

IV. CHRONIC MANIA.—It is often the sequel or prolonged form of an acute case. It is **characterized by** (a) diminished *power of attention*, exalted *memory* (hyper-amnesia), (b) lessened *affection*; (c) want of *consciousness*, *self-control*, *judgment* and *reasoning*. Active, fleeting, extravagant *ideas*, and *unsystematized delusions* and *hallucinations* are often present and he *mutters* almost incessantly. He is *wet* and *dirty* and neglects dress; or, attires fantastically. He can be made to work; he is destructive or indecent, having sexual exaltation. **Prognosis** :—He ultimately gets demented.

[FEMALES, slightly demented and enjoying lucid intervals of sanity (in the midst of chronic mania), exhibit **recurrent mania** at menstrual epochs in the shape of subacute excitements.

IN MALES, similarly, as the majority of all functional manias remit, **periodic mania** is found *coincident with* periods of subsidence of energy. Periodic insanity is a rare event. In it, intervals between attacks as well as the attacks themselves are of some duration. The *symptoms* of each successive attack are similar to those of the first. **Prognosis** : Each attack accentuates the mental weakness and obscures the initial symptoms but does not cause dementia. At any stage in its course, maniacal or melancholic stage may persist. See p. 430.]

V. PUERPERAL INSANITY.

Causes : (1) Neuropathic inheritance (epileptic, neuropathic, alcoholic etc.), (2) Previous attacks of insanity, (3) Mental stress (sudden and prolonged), (4) Aged primipara, (5) Malnutrition

(due to syphilis, tuberculosis, alcoholism, bad hygiene etc.),
(6) Prolonged labour, (7) Toxæmia (sepsis etc.).

Forms assumed : (1) Acute Confusional Insanity ; (2) Dementia Præcox (Katatonic), (3) Maniacal-Depressive Insanity.

Onset—during the first 6 weeks of child-birth. **Duration**—a few weeks. The later the onset, the longer is the duration.

Symptoms : **PHYSICAL :** *Temperature*—101°F to 102°F, *pulse*—weak and quick ; *tongue*—furred, sordes about lips ; *bowels*—constipated ; *urine*—retained ; *breast-secretion*—increased and breasts are liable to form abscesses.

MENTAL : (i) *Premonitory*—Insomnia, indifference. (ii) *Mania*—with blind destructiveness and murderous impulse, talkativeness (specially, about remote past), hallucination of hearing, inattention. (iii) *Confused State* : mania subsides, bodily functions gradually return, everything appears puzzling to patient until she returns to her sanity—being, occasionally, purposefully violent.

Treatment : Prevent injuries to herself and child. Give rectal saline (one pint) every 4 hours for a day or two, nourishing slops through œsophageal tube, purgatives. Treat septicæmia, relieve breasts, avoid sedatives, if you can.

[The mental perversion which arises (a) during *pregnancy* is melancholia, (with or without suicidal tendencies), (b) between 1 and 4 weeks of *delivery*—is mania and, (c) during *lactation* is melancholia.]

VI. MORAL INSANITY. Synonyms : General Moral Mania Sine Delirio ; Reasoning Insanity, Folie Raisonnante, Affective or Emotional Insanity, Moral Imbecility.—[**Moral sense** refers to ideas of right and wrong, truth, purity (sexual or otherwise), justice, wisdom and self control. It is supposed to be (but not actually always is) innate in man. As symptom of disease, it may, however, be *congenitally* absent, be developed *late* in life, or be *lost*, after development.] Hence, Moral Imbecility is characterized by—(a) weak *will*, (b) absence of all

altruistic sense, or (c) perversion of appetite, wherein gratification is sought by *eccentric methods*; or, (d) a combination of one or more of these. The *intellect* (knowing and reasoning) is intact, and there is absence of any *delusions*. Neither education nor punishment can set them right. It is met with chiefly in CHILDREN, particularly those of alcoholic, insane or epileptic parents. Such children, during their early childhood, were perverse, mischievous, cruel, untruthful or thieving, though intellectually gifted or even precocious. It is *incurable*. [IN ADULTS, moral perversions occur (a) as early phase of G. P. I., (b) after recovery from mania or other mental disorders.] According to law, moral sense cannot suffer, without previous disturbance of the intellect; hence, moral insanity, by itself, cannot be a bar to responsibility in civil or criminal acts; but judge of each case, on its own merits. [It is difficult to differentiate moral * 'depravity' from moral 'insanity'.]

VII. EPHEMERAL MANIA. (Epileptic?) Lasting from one hour to a few days, it is of sudden onset and offset, patient resuming normal activities. It is characterized by sleeplessness, *transitory* sensory-motor violence of a *destructive* character, partial or complete unconsciousness of familiar surroundings.

VIII. IMPULSIVE or OBSESSIONAL INSANITY. Synonyms: Insanity of Imperative Ideas, Irrisistible Impulse. †

This is a form of Partial Moral Mania; the patient suffers a reduction of his *inhibition* power, with *excessive positive activities* of mischievous, vicious or criminal kind. [To the exclusion of the normal train of thoughts, against and despite

* The *sexual* aspect is *not* the only aspect to which we apply this term.

† *Apraxia*=inability to form a clear idea of the action to be performed.*

his will, ideas are forced upon the patient's consciousness ; these the patient recognizes to be foreign to him and he suffers mental anguish on that account ; but, as the disorder reaches its acme, these obtrusively recurring ideas are belived and the patient accepts them *as part of his mind* (OBSESSIONS). An IMPULSE "does not require an objective stimulus, though it may have an appropriate occasion ; it is *rhythmic in its onset*." Thus, "such a patient may, for a long time, secretly harbour a *deliberate* intention to achieve his end by insane means, without exhibiting depression, excitement, delusions or enfeeblement of mind ; he knows right from wrong, but, his will is blurred, and the mental portion of his brain works automatically, without any controlling action by the inhibiting centres." ∴, There is blind, unreasoning *fury*, leading to impulses.]

Causes : Epilepsy, idiocy, imbecility, masturbation, keen sexual appetites, female sexual cycles, unstable nervous system, previous or congenital insanity, mania, melancholia, dementia, general paralysis, concealed delusions, alcoholism, sensory irritability in highly strung nervous constitution.

Symptoms : The TYPES of morbid impulses are :
 (1) *General destructiveness*—characterized by instant reaction to all sorts of external and internal stimuli. (2) *Epileptic form*—during and about which, patient has no consciousness.
 (3) *Sexual impulsion** :—marked by proneness to excessive onanism, bestiality ; satyriasis in males and nymphomania in females. (4) *Morbid appetites*—for eating all sorts of filth.

* As a SYMPTOM, the *destructive impulse* is specially common in idiocy, imbecility, dementia, epilepsy, general paralysis, mania, alcoholic excess. The *sexual impulse* is seen in alcoholics and masturbators. *Kleptomania* is seen in insanity with fixed delusion, in incipient stage of G. P. I., as an uncontrolled impulse (without delusion) in women during disordered menses or advanced pregnancy. *Pyromania* is found in adolescent insanity, puerperal mania.

(5) *Homicidal* or *Suicidal mania*, *Kleptomania* (thieving), *Dipsomania* (drinking), *Pyromania* (setting fire to houses). * *Satiety* and *sudden* restoration to *reason* (especially in homicidal cases) *follow upon the indulgence of it*; hence, resistance to it is useless.

Memory of the act and its preceding hallucination, is often absent. *Sensation, preception and judgment* are little affected; insomnia is frequent. In judging **responsibility**, remember that each act is not to be taken by itself but to be looked upon as the sum total of the whole mental process, which again has been of gradual growth.

Diagnosis depends on : (1) an enquiry into the state of consciousness of the patient during and after the attack ; (2) into degree of consciousness and after-memory of the event ; (3) ascertainment of exciting cause, if any ; and (4) estimation of the usual amount of self-control possessed by him.

IX. ACUTE DELIRIOUS MANIA, Typhomania, or Bell's Mania.—The most severe variety of mania. [**Resembles**—Enteric fever, acute pneumonia, acute meningitis]. It is **characterized** by (a) affecting chiefly *females* in apparent health, (b) *unconsciousness* of surroundings, (c) continuous *motor unrest* (with *pyrexia, muttering or whining*, seldom screaming) till she is *exhausted*. **Onset**—usually gradual, often sudden.

Physical symptoms : Her *temperature* is raised (100-104), *pulse* is quick and irregular, *respiration* shallow, *skin* dry, absolute *insomnia* with loss of *appetite*, eyes with stony stare, *tongue* furred, dry sordes about mouth, foul *breath* and absolute *constipation*, *stomach* is rebellious to food. She refuses food and cannot retain nourishment. **Mental Symptoms** :

* *Erotomania* is a chronic functional mental (brain) affection with uncontrollable impulse ; *nymphomania* and *satyriasis* depend on some morbid state of sexual organs.

Jealousy, suspicion, wild reckless cruelty, frenzy, refusal of food. The natural feelings, affections, inclinations, temper, habits, moral and natural dispositions get perverted; the patient can assign *no motives* for his deeds, *nor attempt to conceal* them, *nor to refrain* from similar disorders. There are *no* hallucinations, illusions or delusions. [In coming to a diagnosis, always find out, if motive and purpose underlay the acts or not].

Causes: Congenital (moral imbecility), one-sided genius, sunstroke, injuries to head, previous insanity, epilepsy; it may be a feature of simple mania, intemperance (alcohol, opium &c.) or intestinal toxæmia (para-digestion).

Prognosis: Fifty per cent. of cases die, in 1 to 3 weeks.

Treatment: Rest—if necessary by mechanical restraints. Sustaining food. Wet pack, graduated bath, venesection.

X. DELUSIONAL MANIA=maniacal excitement + *distressing* delusions of an abiding character. [∴ different from—Delusional melancholia and Chronic Delusional Insanity.]

XI. PARANOIA. **Symptoms:** Mono-mania, Partial Intellectual Insanity, Chronic Progressive *systematized* Delusion,* Chronic Delusional Insanity, Magnan's Insanity.

It is not really mania, but a form of delusional insanity.

* Entertaining absurd suggestions for any length of time ends in delusion. **Delusions** may be—(a) *Episodic or systemic*—which are elaborate conceptions, systematically expressed in conduct and conversation; they are curable, non-progressive, being due to bodily illness, to changes of life (puberty, climacteric), to religious or social feelings, or to pregnancy &c. (b) *Fixed*—They are progressive and characterized by absence of inherited or previous insanity and they dominate the life of the patient. [Monomaniacs have delusions (religious, persecutory, suicidal &c). Partial *moral* maniacs, though they have no delusions, may exhibit similar propensities].

Causes—Neurotic heredity, malnutrition, anaemias, crises of life, constitutional diseases, masturbation, chronic renal diseases, constantly suspicious mind, old age, epilepsy, organic brain diseases.

Characteristics : It is a *chronic, progressive* disease, occurring in individuals—(a) who are capable of considerable education, (b) in whom insanity never occurred before, (c) whose other than *judgment* upon subjects immediately involved in and touching their mental defects is perverted and (d) who possess *systematized delusions*—(i) of persecution ; or (ii) relating to wealth, ambition, or politics &c. ; (iii) of *hallucinations* of unseen agencies ; or (iv) ambitious delirium, monomania of grandeur or pride, or unfounded suspicions—*these delusions dominating the patients' whole life and modifying their conduct accordingly*. When the disease is well developed, their delusions are no more confined to one subject only ; the delusions overpower their faculty of self control, and they degenerate into mania or dementia. [Paranoics, therefore, are not imbeciles—for, at the beginning, their sanity was sound.] *The mind cannot be literally impaired in one division, the rest remaining healthy.*

Incubation Stage : Such patients, DURING CHILDHOOD, are either *precocious* or *dull*, are reticent, *suspicious*, irritable, with perverted *sexual* instincts. An exact science like mathematics is their stumbling-block, though they do well in other subjects and have good *memory* : involution of brain begins in them earlier : the disease begins either (a) in early life (*paranoia originaria*) or (b) late in life (*paranoia tarda*). DURING ADOLESCENCE (*in exalted cases*) : Patient is boastful, obtrusive or amorous. *In depressed cases* (wherein his *own* personality is all-important) he sleeps badly, is always suspicious, often even attempting suicide in consequence of fancied wrong done to him. [In both cases, memory, speech, knowledge of his

affairs and capacity for work—are unimpaired : hence, patient can cleverly conceal his delusions for a long time].

Symptoms : DEPRESSED VARIETY : (1) *Delusions* of persecution, jealousy or religio-eroticism (2) *illusions* and (3) *hallucinations* (of feeling, taste, hearing, smell, but not of vision). Such delusions of persecution refer to conspiracy of unknown people or agencies, like mesmerism, electricity, spirits or drugs ; there is no sense of altered personality. The patients change in character and cannot be convinced of their error ; hence they may commit homicide on supposed enemies &c. (4) Disturbance of general sensibility—EXALTED VARIETY (wherein he is possessed by some wild theory, *unconnected* with his *own personality*) : The exaltation may be primary or arise by transformation out of persecutory hallucinations. The exalted ideas* may be seen in matters secular, religious, erotic or litigious.

Varieties : (1) *Early* (2) *Late*, (3) *Persecutory* (depressed) (4) *Ambitious* (exalted) (5) *Intellectual*.—These are really chronic maniacs with apparently hallucinations, delusions &c. confined to a single object. Really speaking, the whole of one's mind is affected. (6) *Affective*=moral insanity, *q. v.* (7) *Instinctive*=impulsive insanity, *q. v.*

Prognosis : The exalted is the better variety. Not curable, when delusions get fixed ; but, in the early stages (dependent on derangement of bodily health), it is often curable : slow course, ending in chronic insanity.

Treatment : Educate mentally defective children separately. Treat them kindly and never allow them to be taunted. Detain in asylum developed cases ; guard against homicide and suicide.

* In G. P., as in Paranoia, there are delusions of grandeur ; but those in G. P. are characterized by—unmeasured assertions without any attempt at logical justification, inconsistency, constant changes.

No medicine is of value. They should be relieved of their occupations.

HOMICIDAL MANIA—is not a disease by itself, but **manifestation of**: (a) **Partial Intellectual Mania**: there is some *delusion* that makes the patient believe that, by committing the deed, he would be conferring a benefit or doing a plain duty. (b) **Epilepsy**: It may prevail in (i) epileptic mania, (ii) *epilepsia larvata* (so-called masked epilepsy), (iii) dreamy state of epilepsy, (iv) the inter-paroxysmal interval. [This epileptic neurosis may remain masked for years, showing itself, not by convulsions, but by periodic attacks of convulsive idea (mania)] (c) **Partial Moral Mania**—as a destructive *impulse* only, unaccompanied by any delusion; **Running Amok**= impulsive form of purposeless *multiple* homicide; due to hemp, drug intoxication, masked epilepsy, somnambulism. There is *preceding* depression and no *memory* of the act. (d) **Puerperal, gestational or epochal insanity**. (e) **Drug intoxication**—chiefly by *cannabis indica*, or as mania a potu (alcohol etc.) (f) **Obsessional Insanity** and (g) **Provocation**, though of a trivial kind.

[*Remarks* :—(a) If it is due to “*intellectual*,” monomania, we shall notice that the patient has no power of directing himself and that his disordered nerves get the upperhand of him—any source of restlessness, activity, illness, drinking etc., swamping all his consciousness, and, arousing various impulses at variance with the patient’s habitual personality. (b) If it is due to *impulsive mania*, we notice morbid reaction to moral or other stimuli, the patient being carried away by zeal for this or that other virtue and having an extravagant conscience, fiercely condemning even the most

* **Epilepsy** affects the mind either as (a) *Melancholia*, or (b) *Mania* (which replaces a grand mal) or as (c) *Dementia*. It causes *idiocy* in infancy, *imbecility* in more advanced youth and *dementia* in later age, and repeated attacks of petit mal are more harmful to mental development than one or two attacks of grand mal.

trifling offences. *An insane person's murder is (a) purposeless (b) savage, (c) without secrecy or help and (d) multiple.*

XII. MANIACAL DEPRESSIVE INSANITY.—It is characterized by the occurrence of (a) mania, (b) melancholia and (c) *anergic stupor*. **Diagnosis** of it is based on the cognition of the facts—(a) that attacks of true mania, melancholia and anergic stupor occur in no other disease; and (b) that a patient who has suffered from mania, is potentially a future case of melancholia and *vice versa*. It is divided into: INTERMITTENT INSANITY, and (2) PERIODIC INSANITY [See p. 421] which latter is sub-divided into (a) *Recurrent Mania*, (b) *Recurrent Mania of Irregular type*, (c) *Recurrent Melancholia*, (d) *Recurrent Melancholia of Irregular type*, (e) *Continued Alternating Insanity*, (f) *True Alternating Insanity*, (g) *Circular Insanity*. **Prognosis**: These periodic insanities occur usually between ages of 20 and 50 and are liable to *relapses*. They seldom lead to dementia, but end in *chronic mania* or *melancholia*. The intermittent form terminates in *dementia*.

CIRCULAR INSANITY. **Synonyms**: *Folie Circulaire*, *Cyclothymia*.—Such cases are rather rare in India. They are characterized by alternations between cyclic periods of melancholia (=depression stage), mania (=joyous, elevated stage) and *sanity*. This cycle (which resembles epileptic insanity) may be a *diurnal* one, or a *monthly* one, or a *seasonal* one. **Ætiology**:—(a) It affects chiefly *young adults* of middle and upper class people during *active sexual* (20 to 50 years) life. (b) When it affects the poor, it is often a sequel to climacteric melancholia.

* **The cycles**—in (a) *Recurrent mania* (or melancholia), of *regular type* are: mania (or melancholia), quiescence. (b) *Irregular type of recurrent mania*, are: mania, rest, mania, rest, melancholia. (c) *Irregular type of melancholia*: melancholia, rest, mania, rest, melancholia, rest. (d) *True alternating insanity*: melancholia, rest, mania, rest. (e) *Circular insanity*, melancholia, mania, rest. *Continuous alternating insanity*: mania, melancholia.

(c) It may be a sequel of *maniacal excitement* and has little to do with menstruation or exhaustion. **Prognosis:** It terminates in dementia. Patient loses weight during mania and gains it during melancholia. Such a cyclism may exist in a neurotic youth, who can be taken on in hand betimes. **Treatment:** Ensure sleep, rest, good health, and maintenance of body-weight. Try to break periodicity by change of air and scene. Interdict marriage.

(D) MELANCHOLIA or DEPRESSION.*

Definition.—It is a simple affective, *periodic* insanity, characterized by a hopeless, *painful* and almost *exclusive self-regard* (PSYCHALGIA)† and an abeyance of interest in things in general, . . . (a) disproportionately severe *mental pain* and *depression*, (b) mental immobility, or inhibition of *mental activities*, (c) *physical* deterioration and inertia. It is the *most conscious* and *most manageable* form of recent insanity.

Causes (more *physical* and *external* than mental or moral):—(1) Profound *physical debility* e.g., after haemorrhages, protracted illness, over-lactation, dyspepsia, wasting diseases, anaemia, acute fevers, heart disease. (2) *Emotional* disturbances—worry, sorrow, failure in business. (3) *Mental over-exertions*. (4) Indulgence in alcohol or morphia. (5) *Neurotic* temperament. (6) Want of society—solitary habits, sedentary life.

* Melancholia may be—(a) the *whole* of a mental disease, by itself; (b) *part* or *stage* of some other mental disease, e.g., G. P. I. or mania; or (c) may *supervene* on—neurasthenia or some bodily ailment.

† **Hypochondriasis**—is also morbid consciousness of bodily mechanism, at the expense of special sense-impressions. Hopelessness does not dominate it. It is DUE TO disordered metabolism of cerebral neurones. It may VARY from otherwise perfect mental stability to actual delusions, and in that case, is an insanity. According to the organ dominating, it is CLASSED into throat, alimentary, sexual, ventral or general hypochondriasis.

Onset—is *insidious*. **Prodromata**—with gradually increasing physical inertia, failing digestive powers, self-centered introspectiveness, combined with sadness.

Symptoms : Psychical :—*Thinking* and *association of ideas*—are slow. *Memory, judgment and reasoning*—are good. *Feeling and perception* are clear. *Delusions*—though these pertain to mental or physical abnormalities or to persecution, are found in later stage (being absent in mild cases and early stages). *Hallucinations* of sight and hearing and frequent tears—are present. Recurring *homicidal* or *suicidal tendencies*, and absolute indifference to the world are found. [His *self-absorption* and indulgence in dismal, dark reveries and gloomy forebodings, with an insane persistency, suggest a selfish gratification.] **Physical** :—*Motor* : All movements (including his customary ones) and emotional reactions—are slow. *Muscles*—are (a) rigid, contracted and weak—in back, neck, shoulders, hips, elbow, knees ; (b) flaccid—in hands and feet (∴ he looks like a hemiplegic) *Sensation*—normal but headaches (rather pressure sensations on top of head), nuchal pain are present. *Tongue* furred, *appetite* lost, *bowels* constipated, *weight* lost. *Urine*—total excretion of phosphoric acid is decreased ; urea falls to half ; formic acid is constantly found ; chlorides and urates, skatol and indican—are increased ; albumin is occasionally met with. *Circulation*—is feeble, causing cold feet and chilblains. *Secretions* of tears, sweat and milk are diminished. *Generative* functions are in abeyance. *Menses*—are stopped.

Facies : Long face, wrinkled forehead, knit eyebrows, pursed mouth. **Attitude** : of general flexion : body and back bent, head bowed, thumb is in a line with fingers.

Prognosis : (a) The slower the onset or the more aged the patient, the slower is the *recovery*. (b) *Suicide* is common in

all varieties, but specially so, in those with delusions of impotence or of persecution or those who hear voices or think themselves as castaways or who suffer from physical weakness or bodily disease or are aged or have an insane heredity. (c) *Relapses* are common. (d) *Death*—is rare. (e) *Melancholia of pregnancy* is favourable but *that of lactation* is grave.

Duration : 3 to 12 months.

Diagnosis from : (1) *G. P.*—by absence of tremors, ataxic speech, altered knee-jerk, Argyll-Robertson pupils. (2) *Dementia Præcox*—by absence of hallucinations of hearing, signs of catalepsy, katatonia, mannerisms, insidious onset. (3) *Acute Confusional Insanity*—by absence of hallucinations, disorders of perception (agnosia, disorientation, illusions of recognition), anæsthesia of hands. (4) *Neurasthenia*—by absence of muscular rigidity, of anorexia and constipation.

Treatment : (1) *Rest*—compulsorily in bed. (2) *Over-feeding*—with predigested liquid nourishment. (3) *Sleep*—under paraldehyde or morphia. (4) *Purgatives*. (5) *Guarding* against suicide.

Varieties : According to (a) what he *thinks* (simple, delusional, hypochondriacal) and (b) what he *does* (stuporous, agitated, resistive &c).

1. **SIMPLE** (*i.e.*, without definite delusions). **Characterized** by—(1) *despondency*, in which the *painful* elements *vis.*, headache, neuralgia &c., preponderate ; (2) *intact reasoning faculty*, *the patient being clearly aware of his altered mentalization* ; and (3) *absence of delusion*. There is psycho-motor torpor, *memory* is normal. **Etiology.** It affects women during climacteric and men who are overworked or over-worried. **Prognosis :**—The condition is curable in a very short time ; if not, patient passes into the second variety. *Suicidal tendencies* are often kept in

check by recognition of his moral obligations and patient can appear in society without attracting attention, though burdened with a heavy mind.

II. (a) **DELUSIONAL**—Characterized by—defective JUDGMENT : hence, delusions occur which are (a) physical (auditory &c.) or psychical (persecutory &c.), (b) fixed, (c) *unconnected* with his *bodily* defects—referring to one or the other primitive instincts of his race. He can employ himself, is without agitation and perhaps little outward manifestations. **Prognosis** :—Occasionally acute exacerbations of uncontrollable excitement occur. It is a good sign, if the subjects of their delusion change. They often commit *suicide*.

(b) **HYPOCHONDRIACAL**—Characterized by—defective JUDGMENT—hence, delusion with reference *only* to his *physical* health, there being greater intellectual inhibition, and perhaps a *trivial chronic trouble at bottom*. Unlike a real melancholic, he looks upon his doctor with much *hope*.

III. **ACUTE AGITATED, EXPRESSIVE or RESISTIVE** : There are 3 Stages : (a) SIMPLE DEPRESSION : *an agonized* frame of mind, not from a sense of pain, but from—(b) DELUSION : chiefly, of his soul being eternally lost ; and (c) DEPRESSION WITH MANIA : he is *in constant movement* (specially if he is observed), plucking out hair, picking at skin, vociferating, moaning, scurrying about. **Symptoms** :—(a) PSYCHICAL : He is capable of apparently sane *conduct*, when left to himself ; any attempt to feed him or to do anything, meets with apparently purposive *resistance*—for which, the patient is not responsible. There is also a callous indifference to the calls of nature. *Perception* of environment and of objects is good, save as regards his delusions and hallucinations. *Volition, instinct and emotion* (feeling) are paralysed. (b) PHYSICAL : *Bodily nutrition* fails and the slightest exertion tires him. *Sensation* is usually normal, peripheral anæsthesia occasionally

occurring. Sleeplessness occurs with rapid *waste*. **Prognosis** :— It may very soon be got over ; or, patient gets into a chronic stage, in which, *if he fattens*, he gets completely demented. **Attitude**—is one of general flexion and adduction. [Some authors consider 'acute' and 'resistive' as two separate varieties—multiplication of names following multiplicity of symptoms].

IV. STUPOROUS. Synonyms : Psycho-coma or Melancholia Attonita.—**Onset** is slow. **Etiology**.—*Females* during adolescence, specially, with *neurotic* temperament, masturbation, sudden fright or severe exhausting illness or eventful puerperium, acute mania. **Symptoms** :—Patient is *entirely listless* (sitting in one position for weeks) from *suspension of movement*, absolutely sunk in her miseries (*delusions*), and cannot, by any effort of *will* (which may be suspended), be roused from the *spell-bound* condition she is in. **Muscular system**—is in a state of catalepsy or patient may be in a stuporous condition of passive resistance, but not violent. There is also *vasomotor* spasm : limbs, asphyxiated. **Nutrition** is at its lowest ebb ; *temperature* is subnormal ; *sensibility* almost nil. **Respiration** shallow, *bowels* constipated. She has to be forcibly fed and she passes excreta under her, never moving a bit (except rarely). **Lasts**—for months or years. **Sequelae** : One of these (*a*) Gradual *recovery* ; if she recovers, she *remembers* the events during her stupor and she frequently attempts *suicide*. (*b*) Chronic *mania*, in which case, patient becomes voluble, her muscles get relaxed, with partial contractures of the limbs, her nutrition improves, but coldness and cyanosis of the extremities persist. (*c*) This kind of stupor is prone to *fulminating activities*—*e. g.*, a somersault, a blow, homicide, suicide, a shout &c. (*d*) Permanent *weak-mindedness*. (*e*) *Death* ["There is no case of acute melancholia that does not threaten stupor, and there is no stupor that is not or has not been melancholic."]

Differential Diagnosis.

	<i>Melancholia Attonita</i>	<i>Katatonic Stupor</i>	<i>Acute De- mentia (Simple Anergic)</i>	<i>Postmaniacal Stupor.</i>
<i>Onset</i>	Gradual.	Insidious.	Sudden.	Gradual.
<i>Mental Con- dition :</i>	Immobility complete; silent; passively resistant.	Immobility; occasional sudden impulsive movement; silent; resistant.	Immobility; silent; non- resistant; No delusions;	Comatose— can be roused, no resistance.
<i>Expression:</i>	Markedly dejected.	Apathetic	Surfeited; interested.	Nothing peculiar; dazed.
<i>Pulse :</i>	Small, feeble, slow	—	Feeble, slow (asphyxia of extre- mities).	Normal
<i>Respiration :</i>	Slow	—	Shallow, slow	Normal.
<i>Food :</i>	Refused	Refused	Eaten, if given	Eaten, if given
<i>Memory (of illness)</i>	Good on recovery	Partial	Lost	Not good
<i>Muscles generally :</i>	Rigid	Flexibilitas cerea	Toneless	Not rigid
<i>Anæsthesia :</i>	None true	Nil	Present	Transitory

V. **HOMICIDAL or SUICIDAL :** Such cases show considerable persistent, disorderly *mental activity* and exhibit the utmost cunning in *concealing* their intention of committing murder. Their desire to kill themselves or others is *due* to the *loss of the primary instinct* of living beings (*i.e.*, that of self-preservation); ideas of *suicide* come in (a) unsuggested, in the midst of one's work and even of enjoyment; (b) but oftener it comes on suggested by the means of committing it: very often, the same patient sticks to the same method of self-destruction. The grounds of *murder* may be from a sense of

(a) personal danger or (b) personal religious advancement ; or, (c) from a belief in being called upon by God to do so, and so on, and even when so-called reasons are adduced, the process of reasoning is not the real motive for the act.

VI. PARTIAL or PHOBIA.—This is characterized by unnecessary development of *distress and fright* regarding objects that are not essentially harmful : knives, scissors, worms excite such fear as to render the patient tremulous, rivetted to the spot, with pupils dilated, face ashy pale and thoroughly exhausted.

(E) STUPOR.

Definition : This *psycho-motor paralysis*—is hardly a clinical entity, but rather a *phase* of several mental diseases, e.g., exhaustion psychoses (acute confusional insanity), maniacal depressive insanity (maniacal, post-maniacal, anergic), dementia præcox (katatonia), G. P. I., epilepsy, hysteria &c. [*Trance and catalepsy* are forms of stupor.] **Prognosis :** All mental activity tends to be translated into actions—thoughts to be spoken, affections to be demonstrated, projects to be realized ; but in stupor, the mechanisms of speech and deed are halting or entirely undirected from above, or in abeyance. The mind *sleeps*, and, given *favourable* conditions, revives ; but if conditions are unfavourable, the mind dies (= *dementia*).

Symptoms :—The *mind* fails to conceive, to argue, to judge, to plan, to express, to memorise,—but has the volition only to *resist*. His *muscles* become paretic and *atrophy* : hence, face, trunk and limbs are expressionless. He can stand, walk and eat. He remains silent and motionless in one place and posture for months. He does not react to ordinary non-painful stimuli, but there is no loss of common *sensibility*. Heart's action is low ; body is cold.

Treatment (1) Warmth, conservation of strength and energy. (2) Rouse his dormant consciousness. (3) Feed him up ; and give laxatives. (4) Galvanism, friction, passive forced exercise.

Varieties :

I. **SIMPLE ANERGIC**—It is *miscalled* Acute or Primary Curable Dementia.

Onset—sudden. **Recovery**—may be gradual or sudden.

Causes : [It affects young adults chiefly.] Acute fevers, epileptic seizures, general paralysis, masturbation, excitements during puberty and adolescence, maniacal attacks, shock, prolonged alcoholic indulgence, exhausting discharges, hæmorrhage.

Symptoms : *Circulation* is weak ; hence œdema and cyanosis of extremities and trophic changes. *Appearance* : patient may look gross or emaciated ; body weight is lost. *Mind* is blank, at least outwardly : he may feel an interest in his environments but cannot show it ; he lies immobile and silent, does not resist movements. Has no emotions, hallucination or delusions, and he does not resist administration of food ; passes excreta under him. *trophic* changes (pustules) occur : buccal mucous membrane is ulcerated, catamenia is absent. *Muscles*—practically non-existent. There is no rigidity, though apparently there may be *flexibilitas cerea*.

II. **MELANCHOLIC**.—See under Melancholia (Stuporous.)

III. **DELUSIONAL**.—The suddenness and abiding character of a delusion may determine this condition.

IV. **CATALEPTIC**.—See next chapter.

(F) DEMENTIA.

Definition : (I) **Medically**, Dementia is an *acquired* condition, in *adult* life, of *partial* and premature death of *once*

present mind. [The individual affected, develops his mental powers from birth ; these subsequently fail, the individual reverting to a condition resembling amentia]. *Motor* functions also suffer, *sensibility* becomes blunt, *trophic* and *organic* functions and *reflexes* are impaired. It is a relapse to the visceral phase (which is also conspicuous in some melancholias).

(II) **Legally**, Dementia is synonymous with Insanity, there being two **VARIETIES** of it : (a) D. *Naturalis* = congenital insanity ; and, (b) D. *Adventitia* or *Accidentalis* = acquired insanity. See p.

Causes : (1) Long-continued epilepsy, mania, melancholia. (2) Destruction of brain—by cysts, tumours, injuries. (3) Senile arteritis. (4) Chronic Alcohol, lead, syphilis. (5) It also accompanies—tabes, senile chorea.

Symptoms : *Commencing with* loss of feeling and affection, blunting of senses and weakening of emotions and energy, with insomnia, egoism, selfishness, it *results in*—loss of higher control and mental power and mental callousness.

Diagnosis. (1) Discriminate the *syphilitic* cases—by pupillary reaction, lymphocytosis, the Noguchi test and Wassermann reaction. (2) In *primary* cases, be guided by—the history, appearances (unemotional, langourous, expressionless) the pupils, insomnia, previous attacks, blood-pressure.

Treatment : Isolation, rest, continuous tepid bath, electric bath, muscular exercise, nourishing diet, laxatives, antisiphilitic treatment, testicular extract, good nursing ; bromides, chloral, hyoscyamus, sulphonal—if required.

Varieties :

I. **ACUTE**—("Stupor") A rare condition.

Causes : Affects chiefly adolescents. Acute mania, monomania, alcoholic excess, inherited brain defect, excessive

venery, trauma capitis, acute fevers, violent mental shock. **Onset** is usually gradual ; may also be sudden.

Symptoms : *Sudden* ablation of the *mental* faculties. Complete *lethargy* after brief excitement or depression. There are no delusions, no muscular resistance, no attempt to swallow food placed inside mouth, no mimetic expression ; body weight, vasomotor tonus and spinal and pupillary reflexes are diminished ; circulation is sluggish.

Treatment : Tonics, hot baths, digitalis &c.

II. CHRONIC : This is the eventual result of any form of mental alienation that fails to be restored to mental health. The *mind* is totally destroyed, the *automatic* and *vegetative* functions remaining. The *facial* innervation becomes irregular so that homologous groups of muscles of face act irregularly, *saliva* constantly dribbling out. Premature *senility* sets in (wrinkling of skin, greying of hair &c.) with *vasomotor* paresis (cyanosis and oedema of extremities).

Varieties :—

1. **Agitated dementia** :—The patient, ordinarily calm and childish, exhibits some *automatic*, vague *restlessness* (akin to attacks of mania).

2. **Passive dementia** :—The patient is extremely *apathetic*, is inert and incapable of attending to the necessities of life.

3. **Primary**—such as occurs in senility.

4. **Secondary**—those into which most *uncured* cases of mental alienation (manias more than melancholias) merge.

5. **Consecutive**—consequent on prolonged excitement or epileptic disturbances.

6. **Organic**—the result of gross brain lesion.

III. GENERAL PARALYSIS OF THE INSANE, DEMENTIA PARALYTICA, G. P. I., SOFTENING OF THE BRAIN.

Characterized by : (1) *progressive decay of brain*, (2) *progressive dementia* (3) *motor paresis*, with progressive generalized *tremors* and convulsions, *articulatory defects* of speech, (4) *grandiose delusions* (5) Death ultimately. *It is rare in India and rare after age 50.*

Etiology : Syphilization and civilization ; alcoholism ? It is not caused by direct syphilitic inoculation but is an indirect or nutritional effect of syphilitic toxin. **Onset**—insidious.

Morbid anatomy : *Parenchymatous encephalitis*:—Atrophy of *brain*, specially in frontal and central convolutions ; dilatation of lateral ventricles, disappearance of *tangential fibres* of cortex, increase of spidercells of *neuroglia* and of *cerebro-spinal fluid*, thickening of blood vessels of brain and changes in the meninges, atrophy of *spinal cord*.

Symptoms : **Stage Prodromal or Medico-legal** (Tremor and Irritability)*: (A) COMMENCING DEMENTIA : (1) *Conduct* and *character* are suddenly changed : patient is irritable, hypochondriac, apprehensive. (2) *Memory, Intellect* and *Judgment*—fail to some extent ; mistakes occur in writing and speaking. Patient is *sexually* hyperæsthetic, indecent ; given to *alcoholic* excess and wild *speculation* ; some times depressed but often *mentally overactive*. (B) SOMATIC DISTURBANCES : Apoplectiform, epileptiform congestive seizures, hemiplegia, ptosis, strabismus, diplopia, neuralgias, headaches, &c. *Insomnia. Poorly appetite*, digestion disordered, constipation.

Stage 1 : (Stage of Fits) MENTAL=Progressive dementia, leading to unconscious automatism : judgment, auto-critical faculty, control, orientation in time and space are lost. *Delusions* of *grandiose* character, of wealth and powers (rarely, of

persecutory type or with depression) and derived chiefly from current events ; or *delirium* (exalted or depressed) ; or an alternation between delirium and delusion—characterize this stage.

PHYSICAL : 1. *Expression*—imbecile-like, with elation or beatitude ; or drooping and drowsy. Face-muscles undergo fibrillary contraction. 2. *Tongue*—tremulous. *Speech*—halting, jerky, tremulous, ∴ blurred and indistinct. 3. *Handwriting*—tremulous, disjointed. Gradual *motor* weakness—ataxia of limbs, fatigue on slight exertion. 4. *Knee-jerks*—increased. *Pupils*—of Argyll-Robertson type, unequal size, irregular outline. 5. Headaches. 6. *Apoplecticiform* or *epilepticiform* attacks,—the former being accompanied by transitory monoplegia or hemiplegia and rise of *temperature* from the very commencement of the seizure.

Stage 2.—Progressive degeneration of mind and body. Patient begins to have a *vegetative existence* : *eats* enormously, yet losing flesh and progressively getting *weaker* ; becomes *filthy*, hence may have *bed-sores* ; face and hands are *dusky*, *skin* has a greasy look.

Varieties : (1) **Expansive**—as described above. (2) **Melancholic**—with depression, stupor or dementia. (3) **Paralytic**—with no mental symptoms. (4) **Congestive**—with fits of various kinds. (5) **Juvenile**—occurring in persons between ages 15 and 25 (due to congenital syphilis).

Prognosis : Usually *incurable* and *fatal* from (a) subdural hæmorrhage during “fits”, or (b) intercurrent maladies. *Remissions* are usually followed by *relapses*. **Average duration :** 2 years in men, 3 years in women (one year for each stage).

Treatment : Antisyphilitic drugs, salvarsan ; padded room ; generous liquid diet, warmth, hypnotics ; purgatives, urotropine.

Diagnosis : (1) Examine *blood-serum* for Wassermann reaction, which is positive. (2) Examine *cerebro-spinal fluid*

by lumbar puncture, for (a) Wassermann reaction, which again is positive ; and (b) increased lymphocytosis. [The *early* stages of G. P. I. resemble cases of functional or organic diseases of the nervous system *e.g.*, Korsakoff's Syndrome, cerebral tumour, syphilis of nervous system, hysteria, neurasthenia, disseminated sclerosis, arteriosclerosis, hystero-epilepsy &c.] Differentiate from alcoholic insanity, generalized paralysis (multiple peripheral neuritis, hysteria, bulbar paralysis, acute anterior poliomyelitis &c), disseminated sclerosis, paralysis agitans, cerebral syphilis, tabes dorsalis &c.

Remarks.—The INITIAL stages of this disease exhibit derangements of *judgment*, in comparative isolation from other derangements of intellect ; AS IT PROGRESSES, it gradually reduces *all* the intellectual and affective powers to zero, within, say, two to three years, and, *unlike most mental disorders, it is accompanied by gross changes in the brain.*

IV. DEMENTIA PRAECOX, Adolescent or Primary Insanity, Intra-*psychic* ataxia, Schizo-phrenia, Dementia Sejunctiva.

Causes : Bad heredity, innate mental instability, exhausting educational strain, alcoholism, onanism [(a) Endogenous toxin of metabolic origin, (b) gradual breaking up of the mental make-up, from repressed desires, and (c) structural defects (undetected) in brain—are also suggested causes].

It is not a disease but a symptom-complex, met with in persons (aged between 20 and 30 years) who have gone through a *slow* process of mental decay. If "affects those who, under undue stimulation or pressure have taken high places at school ...or in college...or those, who under a severe strain, have obtained in spite of their youth and short experience, commanding positions in commerce and trade".

Onset is gradual, with headache, insomnia, changed disposition (suicidal attempt, katatonic excitement, mental retardation and misery, solitary disposition etc.), neurasthenia or hysteria—patient being anæmic and poorly in health.

Symptoms : (A) Psychic [=complete splitting up of mind, resulting in (a) want of proper correlation between the various mental processes ; (b) emotional apathy, (c) mental inaccessibility, (d) decay of certain specific parts of mind]—(1) **EMOTIONAL** exaltation or depression (with or without suicidal tendency), followed by its apathy, resulting in total disregard of the claim of duty. (2) **ATTENTION**—is weakened or occasionally morbidly fixed on one subject (=fascination). *Hallucinations* of the senses ; melancholic, persecutory or grandiose *delusions*—may be present. Memory, perception and orientation—are intact. Permanent dementia—in the end. (3) **STUPOR**—during which, patient is *conscious*, without evincing *interest* in the daily necessities of life or *feeling* pain, sometimes even betraying *intelligence* (mind being more active than is apparent). *Cataleptic* state succeeds to active state. (4) Regarding **CONDUCT**, during active states, he may evince—a positive waywardness (or, negativism =likes to be left alone, resisting suggestions), mutism, imitative disposition (echolalia, echopraxia, verbigeration &c.), antics, grimaces, or mannerisms. His *mind is split up*—there being no correlation between his emotions, thoughts and actions—and *inaccessible* to the examiner.

(B) **Somatic**.—*Pupils*—irregular or dilated and react to light ; *Reflexes* (deep) exaggerated ; superficial ones being normal. *Anæsthesia*. *Pulse* quick, irregular, of low tension ; slow capillary circulation in extremities. *Hair* is erect. *Skin*—action, *complexion* sallow. *Appetite* poor, *bowels* constipated.

Menses suppressed. Occipital headache present, *forehead* is transversely wrinkled.*

Stigmata—Deformities of hair, pinnæ, palate ; hands of chimpanzee-type, laxity of ligaments of metacarpo-phalangeal joints,—very frequently present.†

Diagnosis from (1) *Psychasthenic states*, by patients not being anxious about themselves. (2) *Maniacal-depressive insanity*—by occurrence of mental dissociation, grotesque delusion, presence of faulty habits. (3) *Acute Confusional Insanity*—by the late‡ development of disorientation, loss of memory, bodily condition being good. (4) *Paranoia* by delusions being not systematized.

Prognosis :—Complete recovery is rare ; occasional instances of useful life are rarer still, progressive mental enfeeblement being common. Prognosis is *bad* in D. Paranoides, *worse* in Katatonia and *worst* in Hebephrenia.

Treatment—practically *nil*, beyond good hygiene, careful nursing and supervision and *re-education* of demented mind may be tried. Weir-Mitchell, thyroid, psycho-analysis treatments are useless, while the use of *sedatives* is injurious.

*In *melancholia*, the forehead is wrinkled between the eyebrows ; in D. *Præcox*, the wrinkling is higher and carried out beyond supraorbital ridges.

† In *melancholia*, rigidity affects the large proximal joints most.

‡ Clinical differentiation is difficult. Kræpelin admits that all cases of D. *Præcox* are not precocious and gives this new Classification :—(1) *Dementia Simplex*=insidious erosion of the entire mental life. (2) *Silly Dementia*=desultoriness in thought, feeling and act and progressive mental deterioration. (3) *Simple Depressive or Stuporous Deterioration*. (4) *Depressive deterioration with delusion* in which bizarre, incongruous delusions are widely developed. (5) *Excited varieties*—circular, agitated, periodic &c. (6) *Katatonia*. (7) *Paranoid*. (8) *With speech confusion*.

Varieties and Classification :—

1. Simple weakmindedness.

2. **Hebephrenia**.—Begins insidiously at adolescence or puberty, with symptoms resembling those of neurasthenia; excitements are occasional but rare, suicidal tendencies frequent.

3. **Dementia Paranoides**—characterized by delusions (chronic and melancholy, persecutory, grandiose, sexual) with hallucinations.

4. **Katatonía**—ONSET in early adult life and rapid. CHARACTERIZED BY—initial depression (not melancholia), followed by excitement or stupor. The *symptoms* are severer, *course* more rapid and *PROGNOSIS* better than in hebephrenia. Katatonic symptoms may appear in course of hebephrenia, hebephrenia may *pass into* paranoid form. SYMPTOMS :—Patient is mute, immobile, resistant (all muscles being rigid), insensitive to ordinary stimuli; he has sometimes sudden impulsive-movements. *Flexibilitas cerea* may be found occasionally. Extremities are cold, cyanosed, oedematous, as are face, nose and lips. There is uniform rigidity of joints.

(G)—TOXIC INSANITIES.

General Introduction. (*a*) The *amount* and (*b*) *nature* of the drug indulged in, (*c*) the *susceptible, unstable nervous* organization of the individual, (*d*) *heredity*, (*e*) *environments* and (*f*) *other attendant circumstances*—all combine to bring about insanity in the indulger.

[As chronic drug-habit carries with it a corresponding *intolerance* of a *sudden* reduction in the quantity of the drug circulating in the blood, *sudden withdrawals* lead to sudden death—hence, always break such habits *very gradually*. If a drug-habit is *once broken off* and resumed later, much *less* quantity is *tolerated* than in former times.]

Legal. (a) When intemperate habits brought on a disease which produced incapacity to know the nature of an act or what was wrong or contrary to law, the *exception to criminal liability* on account of unsoundness of mind, as contemplated under sec. 84 I. P. C. would apply and the fact that the habit of intemperance was voluntary or that the disease was of temporary nature would not make any difference. (6. C. W. N., 506.) (b) Drug-habits tend to *enslave* the victim to the habit but hardly ever lead to committal of crimes.

1. ALCOHOL.*

I. MANIA A POTU. Synonyms : Delirium Ebriosum, Transitory or Immediate or Hysterical Alcoholic Mania. **Onset**—is sudden. **Symptoms** : = Perverted ATTENTION + excessive PURPOSIVE MOVEMENTS of a blindly *impulsive* character, leading to homicide, suicide, arson or rape. The patient's hand and tongue are *tremulous* (∴ difficulty of articulation) and his *gait* is ataxic, though patient can steady himself, if he wills to do so. [This is a degree severer than "Drunk and Disorderly"† conduct. It is found chiefly in those instably nervous persons who, owing to their great susceptibility to the action of alcohol, are *never systematically* heavy drinkers]

Treatment.—Patients usually recover in two days ; but, as in some rare cases, coma and death may ensue, it is best to wash out the stomach.

* In *Acute* forms, visual and aural illusions and hallucinations predominate. In the *Chronic* forms, there is a blunting of common sensations.

† INTOXICATION and DRUNKENNESS are not 'alcoholism'. The last one (ALCOHOLISM) indicates such a progressive reduction or dissolution of "*will*" as to completely *disable* the sufferer from *resisting or refusing* alcohol.

II. ACUTE ALCOHOLIC HALLUCINOSIS.—Found chiefly in those naturally predisposed to insanity, and is characterized by disturbance of JUDGMENT. Onset : *suddenly* and at night.

Symptoms—may range from those resembling *delirium tremens*, to real attacks of *acute mania*. Thus, there may be—*Hallucinations* (auditory) concerning things real ; and *Delusions* of persecution or suspicion, infidelity (hence, such patients are always *dangerous* to themselves and to others). *Orientalion*, *ideation* and *memory* are good ; but patients retain no memory of their attacks. *Tremors*, occasional facial *paresis*, unequal *pupils*, exaggerated *reflexes*, altered *speech* are also found. **Duration** : 1 to 2 days to weeks.

Treatment. Prolonged cold baths (but render body warm later) ; cold to head ; frequent liquid nourishment ; digitalis, strychnine for heart ; ergotine and morphine hypodermically for cerebral excitement.

III. DELIRIUM TREMENS, D. T. ["Though the nervous symptoms are acute, they are *not* due to alcohol itself, of which not a drop may be in circulation. It is essentially an *acute failure of central nerve-power*, supervening upon *prolonged alcoholic malnutrition*."]—It is an *acute* temporary attack of insanity in a *chronic* drinker.

Causes : EXCITING (a) *Shock* (accident, fright etc) ; (b) *acute inflammations* (specially pneumonia) ; (c) sudden withdrawal of alcohol (= *deranged metabolism*) ; (d) microbic or other *poisons* (as in fractures). PREDISPOSING : *exhaustion*, *sleeplessness* and privation of *food* in a chronic drinker.

Prodromes : Insomnia, loss of appetite, sudden drinking excess, suspicions, jealousy.

Symptoms : MOTOR DISORDERS : (a) *Tremors*—at first local (in lips, fingers, nostrils) then general, specially noticeable in early

morning, due to paresis of voluntary movement ; (b) uncontrollable *restlessness*. (2) HALLUCINATIONS—of hearing and sight (also erotic) *e.g.*, seeing moving creatures or hearing roar of animals or threats of persons ; all creatures appear to be moving, slate-blue in colour and to excite horror ; hence, *insane fear and terror* which may impel him, say, to jump out of window or run about with a broken limb, regardless of the pain it may cause. There is no real suicidal tendency, except what is dictated by wild terror, as in examples just cited. (3) ACUTE DELIRIUM (of low muttering, busy, vigilant form) with rare murderous outbursts. *Recognition* of persons, and surroundings is intact. *Disposition* constantly changed. *Self recognition* is retained, but imperception (psychical and sensory), disorientation in time and space occur and *memory* is lost. He constantly converses with himself or imaginary persons and is capable of answering rationally on other subjects than his delusion. PHYSICALLY :—*Urine* scanty or suppressed or *albuminuria* occurs with *casts* and *leucocytosis* is common. *Face* is flushed. *Temperature* at beginning is slightly raised but may also be subnormal. *Skin* is in sweat. Acute gastric disturbances occur. *Tongue*, moist and furred, tremulous and in bad cases, dry, brown, covered with sordes. Field of vision is contracted ; *pupils* dilated. Absolute *sleeplessness*.

Prognosis : (a) (1) Persistent insomnia, aggravated anorexia, increasing vomiting and exhaustion ; and (2) seeing small objects like spiders, beetles (and not large objects like cats and dogs) — both give bad prognosis. (b) *General health* may deteriorate (c) Chronic *dementia* may occur. (d) Patient may *sleep off* his condition. (e) *Death* from intercurrent disease or from heart failure due to exhaustion. **Average duration** of a case — 4 to 10 days. *Amelioration* generally on the 4th day.

Treatment : (1) MAINTAIN STRENGTH — by *liquid nourishment*, if required, through stomach tube, with or without

strychnine, digitalis, caffeine etc. If gastric condition is very bad,—give nux vomica, capsicum, bismuth, essence of pepsin. [Caution : *Avoid giving alcohol,—except* where prostration is extreme or pneumonia complicates the case]

(2) PROCURE SLEEP—by rest in bed, with (if necessary) *mechanical restraints*. If there is much excitement, give *bromides* with *chloral* and *soda bicarb* ; if there is not much excitement, sleep will come on naturally, in 3 or 4 days. If opium has to be given, give three or four $\frac{1}{4}$ gr. doses and no more.

(3) WATCH CAREFULLY—so as to prevent suicide.

[Chloral Hydrate produces identical delirium tremens.]

IV. KORSAKOFF'S PSYCHOSES—are but a transitional stage downwards from delirium tremens. They *affect*—chiefly *women*, who are past 30, married, who habitually *drink* (or imbibe lead, arsenic or infectious diseases) and have uterine or pelvic disorders (of *microbic* nature or origin).

Symptoms : (1) POLY-NEURITIC : weakness of *limbs* (specially lower) even to paraplegia (complete or ataxic) ; *affection gradually of almost every nerve* in the body (facial, ocular etc., causing their paralysis ; or vagal, causing tachycardia). *Sphincters* are not involved, so long as mind is right. *Knee-jerks*—absent or not. *Tenderness* of calf-muscles, *paræsthesiæ*, *anæsthesiæ*.

(2) MENTAL : Mental confusion, APATHY, DISORIENTATION IN TIME and space, LOSS OF MEMORY OF RECENT EVENTS, CONFABULATORY HABITS, personal *illusions*, *delusions* of persecution, visual *hallucinations*. Bad cases become stuporous with rigidly flexed or hyper-extended limbs.

Treatment : Remove microbic lesions in genitals. Give—warmth to extremities, passive movements and massage even if these hurt, and, encourage walking. Avoid bed sore.

V. CHRONIC ALCOHOLIC or HALLUCINATORY INSANITY OR PSEUDO-PARANOIA—is characterized by (a) **HALLUCINATIONS** of special senses (specially, hearing, taste, smell, sight, sexual) which accentuate (b) **MORBID SUSPICIONS** about persons (conspiracy, persecution or malevolence); (d) **DELUSIONS** founded chiefly on suspicion and distrust: this may render him even *dangerous*; (c) **ALTERED ADJUSTMENT TO THE ENVIRONMENT**,—the environments of course remaining unaltered, the mind of the man sees wrong relations; he is morbidly quarrelsome and anxious; *Judgment* is good; patient can think, write and speak fairly coherently; *instinctive* and *volitional* actions are also good.

Treatment: Total withdrawal of alcohol; improvement of general nutrition.

VI. ALCOHOLIC EPILEPSY:—Chronic alcoholism may, in some cases, lead to fibrillar, fascicular or choreiform spasm of voluntary muscles and such a *tonic* spasm (*general* or *local*), followed by *clonus*, may produce alcoholic epilepsy; or, chronic alcoholism may itself, owing to indulgence in it or to sudden stoppage of it, give rise to epileptic attacks (*petit mal*) in *young drunkards, born of alcoholic parents*. The attacks may be *partial* or *complete*; loss of consciousness may be partial or complete and stuporous condition may follow.

Treatment: withdraw alcohol; exhibit bromides.

Dipsomania or drink mono-mania—is an anomalous form of epilepsy; it is periodic and *recurrent*,—often attacking several members of a stock and characterized by 3 successive **STAGES**: (a) Victim is *suddenly* possessed of a *strong* impulse to drink—during which period, he loses all faculties of mind; (b) *Exhaustion* follows, with *return to sanity* and to work; (c) *Abstinence period*—during which, he may so much as even dislike drink. (See p. 425).

VII. ALCOHOLIC DEMENTIA.—If a person drinks chronically, there follow, ultimately, total loss of *mind, morals, motions*

and *sense*, leaving the victim completely demented. The loss of functions are, in order, of—volition, memory, feelings (moods), differentiated (or fine) coordinate movements, delicacy of special and general senses, gross motor, sensory and trophic actions, reflexes etc. *Hallucinations* and *illusions* seen for some time, disappear ultimately, the more demented the victim becomes.

Placing a habitual drunkard under restraint.—

The objects aimed at are : (a) Breaking off the *drug-habit* ; (b) Preventing *injury* to himself and others ; and (c) Cure of *physical* ills and *moral* weakness in respect of drink. These objects are attained by the following means :—

(a) The patient, on admission, is *not* suddenly cut off his drink : the dose of alcohol is *tapered off* ; at the same time, fluid concentrated nourishment is substituted in generous quantities. [It is the dread of having his alcohol suddenly cut off, that deters patients from coming under restraint. And, as, in private families, patients can obtain alcohol by bribing, threatening or cajoling, they should be invariably in Inebriate Houses or under rigid watchers.]

(b) To prevent a patient from injuring others, he should be kept in *padded rooms*, devoid of a shred of furniture, in charge of leisured, *strict*, but *sweet-tempered*, *constant* attendants, who should not only enforce doctor's orders and guard against all likely sources of relapse (by inspecting letters, clothes, luggage etc., and by controlling or forbidding interviews by private persons) but should provide against all emergencies arising out of ill-temper or ill-humour on the part of their charge. [CAUTIONS : (a) *Never* unlawfully put him under mechanical restraints (like straight-waist coat, tight sheets &c.) or chemical restraints (hypnotics). (b) The patient should *not be trusted* (at least in the beginning) to behave properly].

(c) Any physical ill the patient has, is, of course, medically or surgically treated. But, to make him morally stronger in respect of imbibition of alcohol, some of these are suggested :

(i) *Take means to create bad association with drink*—by hypnotic suggestions, by apomorphine injections (so as to make the nausea appear after drink), by secretly mixing pot. permanganate with urine and vomit (so as to make patient believe that drinking causes bloody urine and vomit) ; (ii) *Discipline the patient*—by enforcing observance of a rigid timetable of occupation, by keeping regular hours &c. (iii) With all these, associate *out of door life and good hygiene*.

2. MORPHINISM.

Habit is induced by—constant recourse to : (a) *hypodermic* injections of morphine, (b) *smoking* opium, or (c) *eating* opium in large doses.

Symptoms :* **PHYSICALLY :** Frequent rubbing of nose or scratching their skin. Their mouth is dry, tongue is coated, teeth loose, *appetite* capricious, and they suffer from *gastric* catarrh, *colics*, constipation, and in some cases, from relaxed

* **Abstinence symptoms** :—[A regular six weeks' use of increasing doses of morphia renders one a habitue,—as *oxy-dimorphine* (antagonistic to action of morphia) forms in his tissues, to protect him from poisoning by the increasing doses of the opiate he has been taking.] *Sudden* withdrawal of his usual dose brings out these symptoms :—(1) *Increase of all bodily secretions and excretions* (except sweat), hence,—diarrhoea, salivation with vomiting, hiccup, &c. ; (2) general hyperaesthesia of skin and mucous membranes, and of all the special senses ; (3) palpitation, and circulatory, respiratory disturbances,—hence fall of temperature, *syncopal attacks* ; (4) hallucinatory delirium ; (5) general motor restlessness, cramps and muscular twitchings, exaggerated reflexes ; insomnia ; (6) *intense muscular weakness*,—hence, inability to stand. (7) He may become dangerous to others. [TREATMENT : Inject morphine freely ; use hot water enema for diarrhoea, caffeine for collapse].

bowels. *Heart's* action is irregular. They suffer from albuminuria, uræmia; *impotence*, amenorrhœa, sterility; fever, *insomnia*; myosis, halting gait; impaired nutrition of muscles and nerve of every part of body, peripheral neuritis. **FACIES:** Emaciated, sallow, prematurely old (grey-haired, wrinkled-skinned), puffy of face. **MENTALLY:** Gradually increasing mental feebleness, incapacity for continued thought; they become unreliable (work by them being possible only while under influence of morphia), depraved, immoral and get excited easily or are given to *melancholia* or *delusional insanity*, *hallucinations* of vision, *suicidal* tendency.

Elimination: In *acute* cases,—by bowels, stomach, kidneys. In *chronic* cases,—most of it is oxidised in the tissues.

Detection.

1. *Examine urine for Morphia:* [Urine + HCl + amyl alcohol + shaking. Separate thus urea and bile acids. Alkalize the liquid left, mix amyl alcohol. Evaporate,—morphia is left. [See Dragendorff's process pp. 181]

2. *Examine upper and lower extremities* for—(a) hypodermic puncture-marks and (b) abscesses with foetid contents.

3. Keep him under surveillance, not giving opium and see if craving develops.

Treatment: (1) Completely replace morphine by atropine (gr. 1/16 morphine being reduced every fourth day). *For insomnia*, give bromides, if necessary. (2) *For gastric pains (crises)*: soda bicarb. (3) *For weakness*: digitalis, strychnine, ammonia, generous diet, good hygiene, massage, quinine, iron. (4) *For mental conditions*: isolation, guard against secret indulgence in morphine or alcohol. (5) *To create disgust for the drug*—induce hyoscine poisoning, followed by pilocarpine, to eliminate hyoscine.

Substitutes resorted to by habitue : Cocaine, chloral.

[**Effect of injection of Morphia into a vein direct :** *Onset* within 30 seconds. *Duration :* 15 to 20 minutes. *Tingling* in palms and soles ; *sweating*—profuse. *Heart*—violently excited, then quick, irregular, weak. *Face*—in succession is—flushed, cyanosed, swollen. *Eyes*—are fixed. *Pupils*—dilated. *Respiration* rapid and shallow. Intense *headache*.]

3. COCAINISM (Coca Mania).

HABIT IS INDUCED BY—repeated uses of cocaine with *food or drink* (wines, cocoas, sweetmeats), or, as *nasopharyngeal* or other local applications, or as frequent *hypodermic* injection or as a *drug* taken to cure some ailment.

Symptoms* :—I. PHYSICAL : *Tongue* and *lips* feel swollen. *Nose* and *throat* are chronically congested or dry, with *epistaxis* or local ulceration. Mouth is full of *saliva*. *Teeth*, *tongue* and *lips* are dirty-brown in colour. *Dyspepsia* and *gastric pains* (∴ marked and rapid *wasting*). *Pulse*—rapid, weak (∴, sub-ocular rings and *fainting*, *vertigo* frequently occur). II. **NEURO.**—**MUSCULAR :** *Restlessness*, *tremors*, depression, *impotency*, sensation of formication or of grains of sand or vermins under the skin (*Magnum's sign*). *Pupils* dilated. *Insomnia* present. [Magnum's sign is not found in any other drug-habit]. III. **MENTAL :** (1) *Exhilaration*—followed by (2) *Want of attention*, acute maniacal *delusions* of persecution, (3) *Pleasant* or terrifying *hallucinations* (auditory, visual etc.). (4) *Untruthfulness* and loss of *time-sense* are specially noticeable.

* **Abstinence Symptoms :** Dryness of mouth, *apepsia*, constipation ; muscular weakness ; bradycardia, syncopal tendency ; black specks float before eyes ; formication sensations. Memory, volition, judgment and association of ideas are weak ; patients get delusions or monomania and occasionally become violent too.

PROGNOSIS : Rapid mental and moral degeneracy comes on in 5 to 6 months. Cocaine is the *most* insidiously rapid and permanently enslaving drug, whose victims can never of themselves give it up nor ever regain their mental condition after break of habit. They sometimes commit *suicide*.

TREATMENT : Rigid control over patient, gradual weaning of cocaine ; generous feeding ; ounce doses of sodii bromide, twice daily (never chloral), warm baths, cold to head. Patient to be kept recumbent.

4. CHLORALISM.

Habit is common among—chiefly medical men and journalists. Three forms are usually met with ; *Insomnia* is present in all cases :

1. *Delirium tremens*—with smell of chloroform in breath,
2. *Motor excitement* with hallucinations (of vision and hearing), occasional epileptiform attacks, followed by dementia.
3. *Melancholia*—with hallucinations, muscular torpidity.

Treatment : Slow withdrawal of the drug.

5. CANNABIS INDICA.

Indulgence in it produces five grades of Insanity :

(a) **SIMPLE INTOXICATION** :—(1) *Vertigo*, followed by mental *excitement* ; (2) then follow a sense of *exaltation*, rapid flow of *ideas*, auditory and visual *hallucination*, delirium, excitement, motor activity of an exaggerated kind, with a tendency to *destructive violence*. (3) This is followed by *stupor*.

(b) **MANIA TRANSITORIA** = *Acute Hallucinations* of all the senses, with *delusions* of persecution or exaltation.

(c) **ACUTE MANIA** :—They exhibit—a sense of *well-being*, great restlessness, *short sharp mania of sudden onset*, with

irresistible *impulse* to commit *unprovoked murder*, a tendency to *run amock*, and complete *amnesia* of the period; they suffer from *delusions* of persecution or grandeur. Their face is blood-shot in appearance and the horizontal vessels of the eyes are full.

(d) **CHRONIC MANIA WITH DELUSIONS**—chiefly of persecution.

(e) **DEMENTIA**—with amnesia, apathy, degraded habits, loss of energy.

Treatment: Withdraw drug; feed regularly, give fresh air.

6. BELLADONNA.

Intense delirium, pronounced hallucination and motor agitation mark the case.

7. TOBACCO.

Symptoms: [*Insanity* due to tobacco—is found in growing boys] *Pharynx* and *trachea*—chronically inflamed. *Gastritis* and irritable stomach. *Taste* and *smell*—are dulled. *Cardiac* fluttering, *giddiness*, sleeplessness, *anæmia*, weakness. *Amblyopia*. *Tremor* of voluntary muscles (noticed in the writing and in the difficulty of alignment). [In the decreasing order of toxicity, the habits are: chewing, smoking cigar, pipe, or cigarette].

8. IODOFORM.

Prolonged application clouds the mind, followed by *hallucinations*. *Pulse* and *temperature* are increased, *cyanosis* of extremities occurs, *urine* becomes albuminous.

9. QUININE.

Active *hallucinatory* delirium occurs.

10. LEAD.

Tremor, colic, wristdrop, peroneal paralysis, cramps and pains in limbs, insomnia, giddiness, active delirium with motor excitement, hallucinations of sight and hearing, somnolence and coma—are the order of train of symptoms. There may be optic neuritis, complete amaurosis, high temperature, frequent convulsion. Many patients pass into chronic insanity, with failure of mental and muscular powers.

11. ARSENIC.

Sources : It is habitually eaten (in 2 to 5, upto 20 gr. doses daily) by men (called Arsenicophagi) of Styria, Austria, the Punjab etc., with the intention of avoiding infection or increasing their good looks or *embon point*, or of becoming salacious, pugnaceous or long-winded in toiling up the mountainous path or for getting stout or as a substitute for opium.

Symptoms : *

I. **Gastro—intestinal.** *Dyspepsia* :—Malaise ; distaste for food ; loss of appetite ; constipation alternating with diarrhoea ; colics. Redness and irritation of throat and gums. Tongue—is ulcerated, excoriated or silvery. *Salivation* or dryness of mouth. *Jaundice*.

II. **Cutaneous :** *Skin* is hyperæmic and peels off in scurfs, is itchy and pigmented (chiefly on palms and soles) or keratoid. Eruptions like herpes zoster, erythema, pityriasis, eczema, urticaria or psoriasis in patches. *Hairs* fall out. *Nails* are brittle. *Soles of feet* and *Palms of hands*—show a red, moist, painful or keratoid condition.

* **Sudden withdrawal** of Arsenic in a chronic habitue—usually ends in acute arsenic poisoning, severe gastric pain, diarrhoea, colic and death.

III. Ocular :—Conjunctivitis. Eyelids are puffy and itching and suffused.

IV. Nervous : 1. *Peripheral neuritis*. 2. Darting pain in limbs and high-steppage gait. *Tremors*, stiffness, contraction or *swelling of joints*, disorders of sensibility. 3. *Paralysis* and atrophy of muscles of limbs, especially of extensors. 4. Gradual abolition of patellar reflex. 5. Sleeplessness.

V. Miscellaneous : (1) Widespread *fatty degeneration* of tissues. (2) Suspension of *glycogenic function* of liver. (3) General *cachexia*. (4) *Laryngitis* and bronchitis. (4) Great tendency to *heart-failure* : rapid pulse, embryocardia, oedema of extremities, *dysuria*. (5) *Paralysis*—exactly like that in Ph-poisoning—the legs being more affected than the arms and the extensors and peroneal group are more frequently affected.

Treatment : (1) *Remove source* of poisoning. (2) Give nourishing and easily assimilable *diet*. (3) *For Neuritis*—rest and anodynes followed by massage, electricity and strychnine. (4) *For Heart*—give strophanthus, digitalis and tonics. (5) *For Gastro-intestinal symptoms*—proper diet and medicines. (6) Try *Pot. iodide* in small doses.

12. ANTIPYRIN, ANTIFEBRIN, PHENACETIN.

Symptoms of Antipyrin.—Loss of health generally, with stomatitis, bad *appetite* and *sleep* and apathetic *laziness*. *Eruptions*—*vesicular* (on mouth, hands, genitals), *scarlatini-form* (over whole body), *haemorrhagic* (on extremities) or dusky *erythematous*—appear,—sometimes being painful too. [**During abstinence**,—headache, buzzing in the ears, great excitement, followed by depression. *Patients have no control over their will*].

Symptoms of Antifebrin.—*Skin*-moist and clammy ; body-surfaces, conjunctivæ, tongue, lips, ears, fingers and toes—look cyanosed. Prostration is severe.

13. PARALDEHYDE.

Symptoms: *Anæmia, emaciation, gastritis; heart—weak, irregular, intermittent; muscular incoordination* (tremulousness, unsteady gait); *smell* of the drug in breath; *hallucinations* of sight and hearing; chronic *delusions, impulsive* violence, often *melancholia*.

14. SULPHONAL, TRIONAL, TETRONAL, VERONAL.

Symptoms: Peripheral neuritis, morbiliform eruption, hæmato-porphyrin-uria.

[Chloroform (inhalation or drinking), Ether (drinking and drinking Eau-de-Cologne, Spt. Ammon. Aromat., Chlorodyne are also practised].

CHAPTER XII.

SOME VAGUE NERVOUS CONDITIONS.

(A) HYPNOTISM, MESMERISM.

It is an *artificially* induced condition of *partial* quiescence of *primary* consciousness (allied to sleep),—the secondary consciousness or unconscious mind *obeying the will of hypnotizer*. It can be induced in persons *susceptible* to it, *i.e., of hysterical or unbalanced* nervous constitution. **Susceptibility** is independent of age, sex or occupation. It can be induced by (1) *sensory* or (2) *central* stimulations; (3) by *suggestions*—ordinary verbal (as in "*parâh*"), or telepathic in character (*bân-mârâ*) or (4) by *manipulations* ("*passes*") or by sprinkling mesmerized fluids (*jal-parâ*), or, by giving mesmerized stuffs to eat &c. It is unlike any recognized "disease" with characteristic "Symptoms."

Phenomena induced during hypnosis :—

I In Voluntary muscles :

- (a) **CATALEPSY**—a general nerve storm, without subsequent fatigue,—characterised by—plastic rigidity of voluntary *muscles* ; loss of general and special *sensibility*, of *reflex* irritability and of *consciousness* ; minimum activity of *respiratory* and *cardiac* organs ; and, fall of *temperature*. After remaining (for a few minutes to days) in cast-iron posture, the limbs gradually relax, so as to adapt the pose to the action of gravitation, and now, follow the state of—
- (b) **FLEXIBILITAS CEREÆ**—pliability of limbs (as if made of soft wax) so as to assume and maintain any position in which they are placed.
- (c) **INCREASE OF MUSCULAR POWER**—far beyond the person's own normal strength.
- (d) **PARALYSIS**—of individual, or groups of, muscles.

II. In involuntary muscles and vasomotor system ;—

- (a) *Pulse*—may be slowed or quickened at will, with corresponding rise and fall in *blood-pressure*.
- (b) *Bleeding*—from skin can be induced by suggestions.
- (c) *Local eruptions*—can be induced by similar means.
- (d) *Blisters*—can be raised by suggestion.
- (e) *Alterations of temperature*—can be thus effected.
- (f) *Secretions*—can be regulated at pleasure.

III. In the senses.

- (a) *Vision*
 - (b) *Smell*
 - (c) *Muscular*
 - (d) *Cutaneous*
 - (e) *Thermal*
- } can be altered according to suggestions.
- } sensibilities can be rendered acuter.

- (f) *Hunger and thirst* can be excited or arrested at will.
 (g) *Psychical deafness, dumbness, analgesia, anaesthesia* can be induced by suggestions.

IV. In the Mind :

APPRECIATION OF TIME—is increased during hypnosis and fulfilment of post-hypnotic suggestions, from hypnotiser, precisely to time, has been known.

MEMORY.—In slight hypnosis, memory is unaffected. But in its most profound state (called somnambulism), there is post-hypnotic amnesia—*i.e.*, on waking, the subject has no recollection of what had taken place during hypnosis. On being rehypnotised, he can easily recall all that happened to him during previous hypnosis and recall those of normal life, including things he had forgotten during his waking condition.

VOLITION is not wholly abolished, for, none has been known to act in opposition to his prejudices, feelings and moral sense.

Therapeutically—It has been used to cure functional nervous diseases, but by no means, the organic ones.

Medico-legal points.—(1) A man can hypnotise himself.

2. A hypnotised subject can, by suggestion, be used by the hypnotist as a tool to commit foul crimes and hence, the subject's responsibility in regard to that act is nil.

3. Hypnotism may affect the moral character of the person hypnotised and render his *nerves weak*.

4. **Traces of wounds and injuries** may be produced during this state and subsequently serve as proofs.

5. **Abortion** may be induced by suggestion.

6. At the suggestion of the hypnotiser, while under its influence, the hypnotized person may **accuse innocent persons** of crimes, of which, in his normal mental state, the hypnotised individual would speak perhaps contrarily or plead want of knowledge.

(B.) SOMNAMBULISM, SLEEP-WALKING.

This condition is **common in** childhood and youth, and it may also be **induced by** hypnotism. While in this condition, the *higher* (intellectual) centres activate *partially to one* train of impressions, the result being elaborate physical and intellectual feats, performed in perfectly rational manner, *the brain being inactive to other impressions*. **Homicides** and **suicides** may thus be effected. The *eyes* are open and pupils dilated, the individual perceiving objects in very scanty light. The *tactile sense* becomes acute though there may be analgesia and somnambulists may **hear** and **respond** to verbal sounds. Somnambulists **remember** their dreams, but not their motor acts; whereas, after recovery from insanity, events may be partly recalled. No **responsibility** attaches to their acts. To **rouse them** from their state, resort to—flagellation, venesection, faradism.

(C) HYSTERIA.

It is allied to the hypnotic state—a disease of the *mind* associated with a physical condition of the body, *a nervous explosion*; hence,—a patient is by no means malingering and has absolutely no control over herself. It is **not** due to functional degradation in brain or cord, nor to vasomotor spasm. She may manifest any of these **phenomena**: Anæsthesia, narrowing of the field of vision, fits or paroxysms, pareses, paralyses, contractures, tremors, dermatoses (Reynaud's disease, urticaria, hyperæsthesia &c.), hæmorrhages, aphonia,

aphasia, dysuria, polyuria, anuria, Pott's disease &c. One portion of the mind of a hysteric patient can work, independently of, and without knowledge of, the other ; hence, a hysteric patient, while deeply engaged in conversation with one person, can write replies to questions put during that time by a third person, without in the least interrupting the conversation—"Automatic Writing", "Double Personality".

(D) NEURASTHENIA.

Or, irritable nervous debility, is a condition of *increased reflex irritation*, coupled with a *diminished power of resistance* to pain and depressing influences ; it is *not* hypochondria or fixed delusive idea of some disease or local suffering. [Many of the so-called cases are toxic (post-influenzal), or instances of dementia præcox, or of anxiety-neurosis or of hysteria. A real case exhibits] these **Symptoms** : pure fatigue, sense of pressure on the head, irritable spine, flatulent dyspepsia, constipation. When the chief trouble is in the head, we call it cerebral neurasthenia ; when in the organs of generation, sexual neurasthenia ; &c. Some of these cases (especially the last ones) are perilously near the shadowy line that separates the sound from the unsound mind ; at any rate, neurasthenia is the source of origin of the neuropathic state.

(E) SHAMMING (MALINGERING).

Blindness.—SIMULATED by—instilling *eserine* or *atropine* into the eyes. [DETECTION :—(a) With *normal* sight, if a pencil be held 2" from the eyes, all consecutive letters impressed on the pencil *cannot* be read ; on the other hand, a man *really* blind of *one* eye, will read *all* the letters ! (b) If pushed suddenly down a flight of stairs (arrangement having been made to save him from injury), a shammer will correctly clutch at supports, which a *completely* blind man will *not*.]

Deafness—To DETECT : (a) *Simultaneously* whispering by different persons into *two ears*, *confuses* a man who is shamming ; whereas, a man really deaf in one ear, will correctly report what is said. (b) *Fall of a heavy thing behind*, is noticed by a really deaf man, but ignored by one who shams it. (c) Notice flashes in his eyes while speaking of him in his hearing.

Epileptic fits—cannot be copied wholesale. DETECT by these irregularities : (a) Face is not ashy *pale*, followed by its *lividity*. (b) Muscular twitchings are *jerky* and *irregular*. (c) The *cry* is not characteristic.

Paralysis.—To DETECT,—test muscular movements, reflexes, sensations and electrical reactions.

Hæmatemesis.—IMITATED BY—bringing out blood obtained by sucking spongy gums, or artificial wounds inside mouth or on fingers or by spitting out coloured fluids. DETECTION : (1) Examine the sample microscopically and chemically. (2) *Examine*—gum, fingers and inside of mouth.

Unconsciousness.—If this is unreal, the malingerer will show—(a) *active nystagmus* on the side on which the ear is irrigated continuously with cold water ; (b) *attempts to swallow*, or, in the alternative, *to block his naso-pharynx*, if a little water is poured into his mouth (in a really unconscious man, the water will directly enter the lungs) ; (c) *disgust*, if cold water is poured continually over his face, for a long period.

Insanity—See page 402.

[There is no limit to the extent of degradation or danger to which a man can run, in order to malingering, to escape duty or punishment. Patients have been known to swallow *fæces*, to raise suspicions of *intestinal obstruction*, when they would vomit ; to lacerate the mucous membranes of *rectum*, *vagina*.

or **urethra**, in order to malingering **bleeding** from those parts; to *cauterize* their fauces with nitric acid, to malingering **syphilitic ulceration**; to plug self-inflicted deep wounds with dirty rags, to **keep up a sinus**; to insert tobacco into rectum, to **reduce the pulse** alarmingly; to keep a garlic piece in axilla, to **render skin hot** and so on. It is well to remember in this connexion that there have been men who could cause **dislocation of bones and of abdominal viscera**, at will].

Compensatory development of special senses &c.—

When one or more special senses are lost, other special senses develop acutely, irrespective of the age of the individual. Examples: (1) **Blind people** may acutely develop memory, senses of touch, location, temperature and smell &c. (2) **Deaf people** develop sight, touch and smell; they can tell ingress and egress of people by appreciating minute vibrations and also distance travelled, by the velocity of the moving body.

A PLEA FOR THE CRIMINAL.

Lombroso **classified** criminals as: (1) *Political*—who may be, in another age or climate, lionized as a hero. (2) *By passion*—who commits perhaps a solitary crime, in a life of unblemished heredity and history. (3) *Occasional*—whose bad heredity and innate defects make him a criminal, whenever an opportunity occurs. (4) *Habitual*—who adopts crime as a profession. (5) *Congenital*—who is physically and psychically abnormal or diseased—a moral insane. (6) *Insane*—who forms the final development of the congenital type. The last ones require consideration.

A criminal is a patient.—Modern science looks upon the criminal not as a monster, but as one mentally weak, and, has not only endeavoured to study the causes of criminality, but also to point out, that the measure of punishment should be determined rather by a close study of the *individual* committing

it, than by a study of the illegal *act*: punishment should not smack of vengeance. *Anatomical, physiological or psychological* peculiarities of individuals, influences of *social* environments or of *economical* perturbations (specially those affecting the *prices of spirits and staple grains*), *heat waves*, and such other causes set up sudden and rapid diffusion of too intense a nervous vibration, received at some sensory surface (auditory, muscular, visual, tactile, gustatory etc.) and—a crime is the result. Nothing enters the brain otherwise than by way of the nerves of special sensibility; separated from its sensitive peripheries, the brain sleeps,—we become nullities, for, our personality is nothing else than the sum total of our past sensations. *Sensation, then, is a force, a force that tends to realize itself and become an act.*

A sensory impulse, transmitting itself by the collaterals, goes on from neuron to neuron, *awakening old mental impressions* in its passage. *The activity of the brain cell is proportionate to its nutrition*; if the cells are healthy and well nourished, they erect and push out their tentacles (axons), unless they come into close proximity with the tentacles of a neighbour. If ill nourished, the tentacles may contract or close up a little, thereby *rupturing the conduction* of the impulse, and *failing to wake up past impressions*. The grey substance of the brain is the organ of association, comparison and judgment. If all the necessary portion of it is awakened, it takes note of all the various phases of the action that is likely to be transformed out of the sensory impulse, compares them and pronounces judgment on them and thereby avoids evils. If only *some* portions of it are *rudely and suddenly* awakened, *the other portions remaining uninformed*, the grey matter fails to take a proper perspective of the sensory stimulus, the resulting action being something *mischievous*.

CHAPTER XIII.

LIFE ASSURANCE.

Definition : Insurance is a compact, securing value of *property* in the event of its being lost ; Assurance is insurance on *person's* lives.

Objects : to provide (1) against the **loss of future earnings**, incidental to death of its bread-earner ; (2) **educational, marriage, funeral** or other heavy expenses, at the time when these are due ; and (3) against risks of loss of lives or property by **fire, accidents** etc. By means of a written contract (the **policy**) with the insurance company (**the policy holders**), the party (known as **assurer**, or, **the insured**) pays a fixed annual subscription (**premium**), in consideration for which, his nominee (**the beneficiary**) is to receive a certain fixed sum settled on.

Basis of Contract.—By a careful study of vital statistics, and from accumulated experience, assurance companies have prepared tables of Expectations of Life *, whereby, it is possible

* Table of Expectation of Life (English) after Browne :—

Completed Age.	Years.	Completed Age.	Years.	Completed Age.	Years.	
18	40'90	33	30'74	48	20'82	Indians' expectation is $\frac{2}{3}$ of (90 minus age),—as compared with the European's expectation
19	40'17	34	30'07	49	20'17	
20	39'48	35	29'40	50	19'54	
21	38'80	36	28'73	51	18'90	
22	38'13	37	28'06	52	18'28	
23	37'46	38	27'39	53	17'67	
24	36'79	39	26'72	54	17'06	
25	36'12	40	26'06	55	16'45	
26	35'44	41	25'39	56	15'86	
27	34'77	42	24'73	57	15'26	
28	34'10	43	24'07	58	14'68	
29	33'43	44	23'41	59	14'10	
30	32'76	45	22'76	60	13'53	
31	32'09	46	22'11			
32	31'42	47	21'46			

By **Walpole's rule**, the "expectation" is worked out by deducting the age (*a*) from 96, for persons whose ages are between 20 and 45 ; (*b*) from 90, for ages above 45 ; and by, halving the remainder.

to forecast (to reasonable accuracy) the average duration of life for a large 'group' of individuals, though not for 'individuals by themselves'. On such a basis, those healthy people, whose family history, personal health, occupation and environments are favourable, are **standard lives**, (= persons likely to live up to the 'expectations of life'). Impaired lives, or, persons with faulty family or personal history, with undesirable occupations and environments are **sub-standard lives**. **To make up for the risks of sub-standard lives**, assurance companies arbitrarily either (a) "load" or increase the *premium* ; or, (b) consider him so many years *older* ; or, c) make the *face of the policy* liable to deductions, if death occurs within an arbitrarily fixed period ; or, (d) adopt the '*endowment policy*,' terminable within a short, fixed period.

Rules for Medical Examination :—Longevity and average good health being the only desiderata, examine the candidate, only when he is believed to be in sound health. As lying, misrepresentation, forgery, substitution of persons, etc. are likely to be resorted to, each candidate must be very thoroughly examined. Do not accept any statement off-hand, not magnify trifles, nor overlook points of importance. Be honourable, honest, unequivocal, outspoken, and, in a judicial frame of mind, place together simple facts affecting longevity. [The private medical attendant of a proposer (if he has been named by the proposer) is at liberty to disclose all secrets touching the habits or diseases of the assurer]. Enquire of :

I. Occupation & Residence.—(a) Is there any *hazard*? (b) Does occupation entail *cramped* or *unhealthy postures* in *dusty, ill-ventilated* rooms or lead him to temptations of *drink* or other *vices*? (c) Does it expose him to *noxious fumes* or to *dusts* or *sudden variations of temperature*? (d) Is the locality *unhealthy*? There is distinct hazard in respects of :—*Army officer, bar or hotel keeper, butcher, brewer, contractor, coal-miner, explosive-*

maker, *fisherman*, *fire-department hand*, *game-keeper*, *glass worker*, *glazier*, *grinder*, *guard* (railway), *horse-driver*, *keeper* or *trainer*, *labourer*, *mason*, *miner*, *quarry man*, *railway official*, *police man*, *plumber*, *naval officer*, *sea-man*, *steel-grinder*, *theatre-staff*, *wine dealer*, *train man*, worker in *chemicals* or *chemical industries*. [*Young entrants* (below 28 years of age) *are good risks*, in spite of *family history* of cancer or insanity or with *personal history* of cured asthma or rheumatism, or if of low stature (below 5 ft.) or of excessive height (above 6 ft. 3 in.)].

II. **Family History.**—(a) Is there any hereditary *disease* or *taint*? (b) How far has it left traces of *permanent disability*? (c) Are members of his family *short lived* or long lived? (d) Enquire specifically about occurrence in his family of—asthma, Bright's disease, cancer, diabetes, drunkenness, heart disease, hernia, epilepsy, gout, heat-stroke, insanity, precocity as a boy, rheumatism, sexual vices, 'stone', syphilis, tuberculosis.

III. **Personal History.**—(a) Did he suffer from any disease that is liable to shorten life? (b) Enquire specially about—rickets or scrofula in childhood, consanguinity, venereal troubles, history of typhoid fever (as a cause of gall-stones) or of recurring pain in abdomen, epilepsy, cancer, apoplexy (all recurring), rheumatism (heart), dysentery (liver abscess), pleurisy, serious operations done on him.

IV. **Examine all the Systems of body—thoroughly.**—(a) Note specially—Nystagmus, sluggishness, inequality or Argyll-Robertson or irregularity of PUPILS; scanning or slurring SPEECH; presence of ANKLE CLONUS—or other organic nerve troubles. (b) Do apices of LUNGS expand well and does air enter well at the bases? (c) Does TONGUE show—leukoplakia or tremors? (d) Are the tension, rate, regularity and condition of wall of all ARTERIES normal? [Except during momentary

excitement, pulse over 100 should lead to rejection] (e) Look for presence of these DISEASES:—asthma, cirrhosis of liver, colic (biliary or renal), deformities, dyspepsia, ear (middle) diseases, gonorrhœa, gout, hæmoptysis, hernia, hydrocele, jaundice, palpitation of heart, piles, rheumatism, stricture, syphilis, voice hoarseness or huskiness.

V. Examine—urine, sputum, weight and height of body.

Reject these cases : (a) Persons *below 18 or over 65* years of age, or who, being under 65, have been pensioned off for ill-health or physical incapacity. (b) *Female* applicants, unknown or pregnant. (c) *Unvaccinated* persons. (d) *Deformed* persons (blind, haunch-back). (e) *Cases suffering* from any of these : gastric or *duodenal ulcer*, chronic *diarrhœa*, mucous colitis or *dysentery*, non-congestive *enlargement of liver*, *albuminuria* or *glycosuria* in gouty persons ; recurrent *epistaxis* from diseases of blood vessels or kidneys ; *hæmoptysis* from heart disease ; *phthisis*, with double heredity ; *genito-urinary tuberculosis* ; *casts* persistently present ; *heart* disease with enlargement of heart or changed rhythm or extra-systole ; hypertension in *pulse*, with albumen in urine ; renal or vesical *calculus* ; enlarged *prostate* ; *syphilis* acquired after 40, or, acquired earlier and manifesting symptoms actively ; *tic douloureux* ; *epilepsy* ; tendency to *alcoholic excess* ; *Graves' disease* ; *myxoedema* ; inflammatory ankylosis of the *vertebral column*, grave *kyphosis*, with rheumatic arthritis or chronic rheumatic diseases of spine ; *infantilism* or *dwarfism* ; irreducible *hernia* ; *opium eaters* (over 5 gr daily), *hemp drug* smokers.

Special cases.—1. **Heart-disease** (even when compensated) becomes an additional risk when :—(a) *Age*—is passed middle life. (b) *Family history* of heart-disease, rheumatism, apoplexy, Bright's disease, gout, &c. exists. (c) *Personal history of*—gout, rheumatic fever, chorea, 'growing pains' syphilis. (e) *Health* is poorly (muscles, digestive and excre-

tory systems). (*f*) *Occupation*—lies in atmospheres that are unhealthy, damp and cold, in altitudes high ; and when it involves muscular and mental strain. (*d*) *Habits* of drinking, smoking, debauchery and gluttony. (*g*) *Complications* with—pregnancy, anæmia, arterio sclerosis, Bright's disease, constipation (habitual), dyspepsia, lung trouble (chronic congestion). [*Cardiac Lesions*—in decreasing order of their gravity are : Aortic regurgitation, Double Mitral disease, Mitral stenosis, Aortic stenosis, Mitral regurgitation, Fatty degeneration.]

2. **Albuminuria**—is accepted with caution—(*a*) When hereditary and personal history of any *diathesis* (gout, rheumatism, syphilis), of any permanent *contributors of aggravating organic diseases* (renal diseases, dropsy, chronic dyspepsia, cardiac embarrassment) and of any *permanent changes caused by it* (e. g., in retina) are absent ; (*b*) if patient is *healthy* and *below 40* and his *second aortic sound* is not accentuated ; (*c*) if albuminuria is functional, the amount of *albumin never exceeding 1/8th*, the *specific gravity* of urine lying between 1015 and 1030, there being *no tube casts* (a few hyaline casts being allowable). [Pathological albuminuria is always accompanied by hard pulse, accentuated heart sound and changes in the heart itself.]

3. **Hæmoptysis cases**—can be insured, provided hæmoptysis was due to (*a*) strain and injury years ago, patient's health being otherwise unexceptionable ; (*b*) to tubercle bacillus, provided the proposer is over 40 years of age, that the hæmorrhage occurred at least 15 years ago and that in spite of family history, he is otherwise, in good health, lives healthy, abstemious out-of-door life and has good height and weight. Reject all cases due to heart disease.

4. **Tuberculosis cases** should be rejected when—(*a*) *Family history* is present, both parents or one parent and two brothers or sisters dying of it, (*b*) *Age* is at puberty, (*c*) *Sex* is female,

with possibilities of child-bearing (before age 48), (*d*) *Physique* is poorly, (*e*) *Circumstances* are bad, (*f*) *Habits* and *surroundings* are not cleanly, (*g*) *Occupation* is in damp, dark, confined, dusty places, where he has to stop for long hours, (*h*) *Weight of body* is below normal or progressively lost, (*i*) *Type* of disease is fulminating, (*j*) *Lesion* is—genito-urinary or spinal. [Hip lesions are acceptable—if patient is past 35 years of age; and bone lesions, if health has improved since.] (*k*) *Intercurrent diseases* occur—e. g., anæmia, aortic disease, Bright's disease, bronchitis, cancer, cirrhosis of liver, diabetes, dyspepsia, hæmoptysis (repeated), influenza, leukæmia, laryngeal troubles, measles, nervous degenerations, pleurisy, pulmonary diseases, syphilis, whooping cough.

5. **Female cases.**—Look for these: Menstrual troubles (irregularity, excess), Confinements (number, complications, nature of help called for), Miscarriages, Pelvic operations done (number, nature, time elapsed since), Hernia, Gall-stones, Cancer, Phthisis, Heart disease, whether now frequent, whether menopause has passed. [Generally speaking, expectation of life among European females is greater by 3 years (except during pregnancy) than among their males]

6. **Rheumatism** confining to bed for 6 week or more—requires loading the age by 10 years; by more years, if there has been recurrence. For one attack of *gout*, deduct more than 3 years from expectation of life.

Time Limit in some cases. (These are not 'good, risks') :—Cases presenting any of the following diseases may be accepted on the conditions noted against each :—(*a*) *Appendicitis*—months after operation, or, 3 years after first two attacks (if other attacks have not occurred). (*b*) *Duodenal or Gastric ulcer*—2 years after gastro-enterostomy. (*c*) *Gall stone or Renal colic*—after 3 years of quiescence (if one attack) or 5 years (if two attacks). (*d*) *Gout*.—Prospects of longevity are better, the more

one ages from 30th year. (e) *Hæmorrhoids* (simple), *Hydrocele*, *Elephantiasis*—after operation. (f) *Hernia* (inguinal)—if well fitting truss is worn for 6 months after operation [complications like irreducible omentum or undescended testes add to the risk] (g) *Post nasal Adenoids*—after removal. (h) *Purulent Otorrhoea*—1 year after operation or 2 years after quiescence. (i) *Syphilis*—after 3 to 6 years of date of infection, provided no secondary or tertiary symptoms have appeared in the meantime. (j) *Asthma* (intermittent)—if absent for long time and phthisis has not developed and is absent in family.

Height.	Weight in lb.		Chest circumference.
	Indians.	Europeans.	
5 ft. 0 in.	113	108	33½ inches
5 „ 1 „	119	108	34
5 „ 2 „	123	126	35
5 „ 3 „	125	133	35
5 „ 4 „	129	139	36
5 „ 5 „	139	142	37
5 „ 6 „	142	145	37½
5 „ 7 „	147	148	38
5 „ 8 „	152	155	38½
5 „ 9 „	159	162	39
5 „ 10 „	163	169	39½
5 „ 11 „	173	174	40
6 „ 0 „	182	179	40½
6 „ 1 „	189	187	41

(1) Take height in boots and deduct 1". (2) Measure chest about nipple line in ordinary and forced inspiration and expiration : there should be a minimum difference of 3", except in corpulent people. [In thin, flat-chested persons, anything short, should lead to rejection]. (3) Girth of abdomen should not exceed that of chest. People hereditarily obese from childhood and tall people are bad risks : so are those under or over 20 per cent. mean weight for a particular height. [See APPENDIX (E)].

APPENDICES.

(A) Average Weight of Healthy Adult Viscera.

<i>Viscera.</i>	European.		Indian.	
	<i>Males.</i>	<i>Females.</i>	<i>Males.</i>	<i>Females.</i>
Brain ...	49½ oz.	44 oz.	44 oz.	37 oz.
Spinal Cord...	1 to 1¼ oz.	1 oz.	...	...
Right Lung...	24 oz.	17 oz.	16 oz.	9½ oz.
Left Lung ...	21 oz.	15 oz.	14½ oz.	9½ oz.
Heart ...	11 oz.	9 oz.	7½ oz.	6 oz.
Stomach ...	4½ oz.	4½ oz.	...	...
Liver ...	50—60 oz.	50—60 oz.	44 oz.	37½ oz.
Pancreas ...	2½—3½ oz.	2½ to 3½ oz.	...	...
Spleen ...	5—7 oz.	5—7 oz.	10½ oz.	6½ oz.
Each Kidney	4½ oz.	4½ oz.	3¾ oz.	3½ oz.
Each Suprarenal	1—2 dr.	1—2 dr.	—	—
Uterus (unimpregnated)	—	7—12 dr.	—	—
Thyroid body	1—2 oz.	1—2 oz.	—	—
Thymus (at birth)	½ oz.	½ oz.	¼ oz.	—
Prostate gland	2 dr.	—	—	—
Testicles together	¾ to 1 oz.	—	—	—

(B) Mean diurnal Temperature of body.

The normal temperature of interior of body in health = 98.4°F (36.8°C). The difference between the temperatures of—

Axilla and mouth = 0.4 F.

Axilla and rectum = 0.64 F.

The normal axillary temperature of an Indian is between 96.4 and 99°F. The mean atmospheric temperature in Bengal is between 80° and 100° F.

(C) Age of Menstruation in Bengal.

[English girls in England ...	15th year.]
" " in India ...	14th "
East Indian girls ...	13th "
Indian girls (ordinary) ...	11th "
" " (high class) ...	11th "
Eastern Jew girls ...	14th "

(D) Average body-weight of full-term baby :—

		<i>Indian.</i>	<i>English.</i>
Boys	...	5lb 11 oz.	7lb 3½ oz.
Girls	...	5lb 9 oz.	7lb 0 oz.

(E) Average Adult Height, Weight, Chest Girth.*

		<i>European.</i>	<i>Indian.</i>
Height of body	...	5'5" to 5'6"	5'4"
Weight of body	...	66 kilos	50·50½ kilos
Girth of chest	...	Above 33"	Below 33"

(F) Blood-coagulation—Time & Temperature.

In the LIVING *European* ... 4 to 7 minutes.

Bengalee (India) ... 1½ to 2½ "

In the DEAD—4 to 12 or more hours after death.

Myosin coagulates in mammals at 50°C.

Serum albumin " " 73°C.

Other albuminates " " 47°C.

(G) Spirometry.

HEIGHT.			CAPACITY IN HEALTH.			HEIGHT.			CAPACITY IN HEALTH.		
<i>Ft.</i>	<i>in.</i>	<i>to Ft. in.</i>	<i>Cub. in.</i>			<i>Ft.</i>	<i>in.</i>	<i>to Ft. in.</i>	<i>Cub. in.</i>		
5	0	" 5 1	174			5	6	" 5 7	222		
5	1	" 5 2	182			5	7	" 5 8	230		
5	2	" 5 3	190			5	8	" 5 9	238		
5	3	" 5 4	198			5	9	" 5 10	246		
5	4	" 5 5	206			5	10	" 5 11	254		
5	5	" 5 6	214			5	11	" 6 0	262		

* Taken at or below nipple. (1) The chest measurement should not be less than half the height of the individual. The greater the girth of the chest, the wider is the nail. (2) The difference between full expiration and full inspiration in health, is not less than $\frac{1}{10}$ th the chest-measurement: an expansion of less than 2" is unnatural. Athletes and consumptives expand chest nicely. (3) The *waist measure at umbilicus* does not exceed chest measure. (4) A man of 20 years should grow 2" by the time he is 30 years. (5) The centre of body *at birth* is the naval and *at adolescence*, the pubis; but women have shorter thighs and bigger trunk.

IN ENGLAND

IN INDIA.

(H) Putrefaction Time-Table.

	In Summer.			In Winter.			<i>Average.</i>
	<i>Longest.</i>	<i>Shortest.</i>	<i>Average.</i>	<i>Longest.</i>	<i>Shortest.</i>	<i>Average.</i>	
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	
<i>Irritability of Muscles</i>	... 4. 30	0. 30	1. 51	3. 30	1. 0	1. 42	3 hours or over.
<i>R. M. commences</i>	... 7. 0	0. 40	1. 56	2. 30	0. 25	1. 10	5 to 6 hours to 3 days.
<i>" lasts</i>	... 40. 0	7. 0	19. 12	47. 0	4. 30	31. 30	16 to 24 hours.
<i>Lividity appears</i>	... 31. 30	1. 38	14. 33	21. 30	5. 50	15. 11	4 to 12 hours.
<i>Gases evolve</i>	... 34. 30	5. 50	18. 17	47. 0	16. 10	29. 17	3 to 5 days.
<i>Green Discolorations</i>							
<i>appear</i>	41. 30	7. 10	26. 4	47. 0	16. 10	24. 16	1 to 3 days.
<i>Maggots, Immature</i>	41. 30	3. 20	25. 57	65. 0	—	—	—
<i>Mature</i>	76. 0	24. 18	39. 43	100. 40	64. 50	81. 21	—
<i>Superficial blebs appear</i>	72. 0	35. 0	49. 34	87. 30	23. 30	59. 8	—
<i>Saponification occurs</i>	—	—	3 days	15d.	8d.	8 to 15 days	6 weeks to 2 months 14th to 16th day (summer)
<i>Flotation occurs</i>	...	—	within 24 hours	—	—	3-5 days	6 to 8 weeks (winter).
<i>Cooling occurs</i>	...	—	—	—	—	—	12 to 24 hours.

(I) To make bloated features recognizable.—

(1) Sever the head from trunk and remove the brain. (2) Make deep cuts on the sides and back of head and immerse it in running water in a perforated box for over 12 hours. (3) Replace the top of skull and stitch the scalp and keep it in concentrated alcohol or zinc chloride solution for 12 hours.

(J) Poison Bag.

Every practitioner should have *always ready*, in a separate bag the following things, to meet any emergent poisoning case (those in italics being *indispensable*):—

1. *Stomach pump or tube, with funnel.*
2. *Wooden gag, with tape attached.*
3. Sponge holders.
4. Metallic mouth-gag, protected with rubber for teeth.
5. *Extra-strong rubber tubing, to fit funnel and to fit—*
6. *No. 12, hard rubber catheter* (for child's oesophagus).
7. Soft rubber Catheters No. 2, 4, 6, 8, 10, and a female Catheter.
8. Tape and twine (some quantity).
9. Vaseline or Glycerine, Spt. Vini Rect., Tr.* Iodi, Surgical collodion.
10. *Tongue Forceps.*
11. Intravenous Saline infusion outfit.
12. All-glass *hypodermic syringe.*
13. Dry cupping glasses.
14. Glass douche can (4 pints capacity), fitted with 5 ft. rubber tubing, rectal piece, or, a complete Ingram's Enema syringe.
15. Tracheotomy instruments and tubes etc.
16. *An ounce measure glass and a minim measure glass.*
17. *Blank slips with your name and address printed thereon.*
18. Scalpel, 2 Spencer-wells forceps.
19. Litmus papers.
20. *A copy of this book.*
21. A magneto electric battery.
22. *Your private seal, sealing wax, a candle, match box.*
23. One or two absolutely clean new bottles with new cork.

Medicines :

Acid Citric	<i>Charcoal pulv.</i>	Lime (Calc. Carb.)
<i>Tannic</i>	Chloral hydras	<i>Morphine Sulph.</i> gr. $\frac{1}{4}$
Tartaric	Chlori, Liqr,	<i>Mag. Carb. pond.</i>
Adrenal Extract	<i>Chloroform pure</i>	<i>Sulph.</i>
solution (1 : 1000)	Coffee (pulv. or ext)	Mustard (Durham)
<i>Ammon. Carb.</i>	<i>Cupri Sulph</i>	Oil, Castor
<i>Liq. Fort.</i>	<i>Digitaline</i> gr. $\frac{1}{100}$.	Cocoanut
<i>Amyl nitrite</i> cap-	<i>Ergotine Citras</i> $\frac{1}{100}$.	<i>Olive</i>
sules (m iii each)	Iod., Pot.	Pot. Ferrocyanide
<i>Anteivenene serum</i>	Tinct.	<i>Permang., Pot.</i>
<i>Apomorphine hy-</i>	Ipecac. pulv.	Pilocarpine nitras
<i>drochlor.</i> gr. $\frac{1}{10}$	Iron,	Soapsuds
<i>Atrop. Sulph.</i> $\frac{1}{100}$	cyanide of,	<i>Starch</i> (arrowroot)
Brandy (Exshaw I)	dyalised	<i>Strych. Sulph.</i> gr. $\frac{1}{100}$
<i>Bromide, potassii</i>	Peroxide of	Turpentine (French)
<i>Caffeine Citras</i>	Sulphate of	<i>Zinci Sulph.</i>
Camphor, Spt.	<i>Tr. perchlor.</i>	

(K) Digestion Time-Table.

<i>Article.</i>	<i>Time of Digestion</i>	<i>Article.</i>	<i>Time of Digestion</i>
	hr. min.		hr. min.
Rice ...	... 1 0	Oranges ...	... 2 45
Apples (cooked)	... 1. 30	Mutton (boiled)	... 3. 0
Sago ...	... 1. 45	Butter and cheese	... 3. 30
Banana ...	... 1. 45	Eggs (hard boiled)	... 3. 30
Bread ...	... 2. 0	Pork (boiled)	... 3. 30
Cauliflower	... 2. 0	Nuts ...	... 4. 0
Milk (boiled)	... 2. 0	Fowls ...	... 4. 0
Cabbage	... 2. 0	Wheaten Bread	... 3 to 4 0
Eggs (raw)	... 2. 30	Lobster and crabs	... 4. 0
Green peas	... 2. 30	Cucumber	... 4. 45
Milk (raw)	... 2. 30	Shrimps ...	... 2. 45
Goose ...	... 2. 30	Eggs (soft boiled)	... 3. 0

<i>Article.</i>	<i>Time of Digestion</i>	<i>Article.</i>	<i>Time of Digestion</i>
Lamb ...	2. 30	Melons ...	3. 0
Potatoes (roasted) ...	2. 30	Beef (boiled) ...	3. 0
Custard (baked) ...	2. 45	Carrots „ ...	3. 15
Fish (boiled) ...	2 to 3. 0	Potatoes „ ...	3. 30
Pineapple ...	2. 45	Turnips „ ...	3. 30

As a general rule, the food of an Indian is found in various stages of digestion upto even 6 or 7 hours of its ingestion. Digestion of food does not go on to any considerable extent after death. Auto-digestion of stomach, post-mortem, is also common and is not always associated with active digestion before death.

(L) Handwriting.

Handwriting being a record of the movement of the muscles of the upper limb, made at a certain rate of speed, becomes **individualized** from the time one begins to write, although, it is gradually **developed** according to one's occupation, age, habits, health, surroundings, the amount of writing done, the material for writing and the circumstances of writing. In writing, some **people** use their *fingers* most (thumb, first and second fingers, upto their 2nd and, at most, 3rd joints); others, their *hand*—whole hand, with the wrist as centre: others with their forearm muscles as centre, use *the hand and arm*; while others use *the entire arm*, the forearm not resting on any support.

Every **suspected document** should be handled, folded, and exposed to light and air *as little as possible*. It should be *photographed, being enlarged at least 8 times*, and a dozen specimens of handwriting of a suspected individual should be obtained on the spot, for purposes of comparison.

Pencil-writing calls for more action of fingers (∴ more pen-pressure and overwriting), more pressure on paper (∴ less free-run) and no pen-lifts at all (∴ want of lack of continuity, of tremors and of hesitation).

The following are the distinguishing points between—

Genuine writing *vs.* **Forged writing.**

- | | |
|---|--|
| 1. The writing is <i>easy</i> (<i>i.e.</i> is done with writing movement). | 1. The writing is <i>patchy</i> and done with short strokes and retouches. |
| 2. The connecting <i>upward</i> strokes of letters are mostly <i>smoother</i> than the downward ones. | 2. The <i>downward</i> strokes are <i>smoother</i> than the connecting upward ones. |
| 3. The <i>strokes taper</i> at the commencement and end. | 3. They are <i>stumpy and blunt</i> at beginning and at end. |
| 4. It may show hesitation and stoppage of pen at <i>natural</i> places. | 4. Hesitations are at <i>upward</i> or <i>downward</i> strokes and even at the <i>middle of a continuation</i> . |
| 5. Indentations <i>not</i> common | 5. Indentations are <i>common</i> . |
| 6. Even if tremors be present, there are free strokes as well. | 6. Hesitations and tremors are present at <i>wrong places</i> . |

IN COMPARING HANDWRITINGS, PAY ATTENTION TO :—

I. General Features :—

1. General *appearance* or pictorial effects.
2. General *style* or system of writing.
3. *Slant* of upward and downward strokes (average).
4. *Spacing* of letters in words and of words in sentences.
5. *Size* of small and capital letters.
6. *Proportions* of individual letters to each other and of parts of the same word.
7. *Pen-lifts* : general habit before and after what letters ?
8. *Connexions* of all letters with each other and of capitals with small letters.
9. Forms of all *small letters*—habitual, rare, occasional.
10. Forms of all varieties of *capital letters*.
11. Forms of *figures, punctuation marks, abbreviations*.

II. Movement or manner of writing :—

1. *Speed* : uniformity or consistency of it.
2. *Care and attention* : utter abandon or ordinary care or delicate attention even to end of unimportant strokes or inconsistent attention.
3. *Pen-position* as shown by location of shading and by indentations on right or left of line.
4. *Alignment* (words having up or downward tendency).
5. *Movement impulse*.
6. Flourishes (extra *strokes*) or deficient strokes.

III. Pen-pressure and shading :—

1. *Shading*—on all capitals, small letters, figures.
2. *Location of shading* on letters, main downward strokes, on lateral strokes, on diagonal strokes.
3. Exact location of *nib-marks* and maximum shades.
4. Pressure uniform on both *nibs* or heavier on one side?
5. Beginning of *strokes* with fine line or with pressure, ending-stroke with fine line or with pressure or dead stop.
6. Final *strokes* carefully drawn or finished or free and unconscious.

(M) Directions for holding P. M. (see p. 36).

[At every step examine minutely before advancing further].

External Inspection : [See p.34] Note—(1) *Height*, (2) *Weight*, (3) *Sex*, (4) *Colour* and state of skin. (5) Approximate *Age*, (6) *Nutrition*, (7) *Temperatures* of body and of room. (8) *Rigor mortis*, *lividity* or stain, cadaveric *spasm*, presence of *putrefaction*. (9) Position and contents of *hands* and condition of *fingers* and *toes*. (10) Condition of *dress* (if clothed). (11) *Orifices* of body (for discharges, injuries, foreign bodies), (12) *Teeth*. (See p. 38).

Head. (1) Cut through the *scalp*, across the top of head from ear to ear and reflect one flap of the scalp forwards to within 1" of the orbits and the other backwards to a little below occipital protuberance. (2) Saw through the *skull* all around, horizontally at a level slightly above that of the scalp flaps and lift it off without using chisel.

and hammer, and after detaching it from the dura mater. (3) Divide and reflect the *dura mater* from both sides and from in front and behind and along the petrous portion of the temporal bones. (4) Insert the scalpel as deeply as possible into the spinal canal and slice off the *spinal cord*: the brain is now free to be removed. [Examine carefully—interior of skull, condition of meninges and vessels, pons, medulla, cerebellum and cerebrum]

Thorax. (1) *Along the middle line* of the body, and from a little above the suprasternal notch to $\frac{1}{2}$ " above navel, cut away skin and muscles (in one lump) so as to expose peritoneum and the ribs with their cartilages. (2) From here prolong the incision to the right and left superior iliac spines. (3) Divide both *claviculo-sternal articulations*; cut *along the outer borders of costal cartilages* and reflect abdomen-wards the sternum with attached cartilages, without cutting diaphragm. (4) Open the *pericardium*. (5) Incise, in order, into the right ventricle, right auricle, left auricle and left ventricle of *heart*. (6) Now remove *lungs and heart together*, as well as the *larynx* and *tongue* and *œsophagus* (after having ligated the lower end of the œsophagus),—by prolonging the incision to chin, by reflecting the skin to ears on both sides and by cutting into the mouth along the inner aspect of horizontal ramus of jaw. [Examine specially:—thymus, mediastinum, competency of valves of heart, atheroma of aorta, deeper tissues of neck.]

Abdomen : Slit open the peritoneum. Examine *each viscus*—*first* in situ and then after removing it outside, a hollow viscus being ligatured at both ends before it is removed.

Spinal Cord.—Incise the skin along the spinous processes from occiput to coccyx. Then reflecting soft tissues on both sides, saw through the laminæ on both sides, along the whole length and remove them with the adherent spinous process. Then remove the cord, cutting its attachments, and cutting it into sections between each two pairs of nerve roots. [Examine spine for fractures.]

In case of Fœtus, note (a) *Umbilicus*—its condition and position; (b) *Skin*—its condition, secretions, appendages; (c) *Contents* of stomach and intestines; (d) *Testes*—their size and positions

(e) *Thymus* ; (f) *Height and weight* of the whole body, of the cord and of placenta ; (g) *Heart*—its orifices &c. ; (h) *All orifices* of the body ; (i) *Pupillary membrane* ; (j) *Centres of ossification*, especially in the lower end of femur. [See pp. 43, 328, 330].

(N) Post Mortem Report Form (Indian).

In the printed official forms, the following columns and sub-columns occur, under which the examining surgeon has to note the results of his autopsy :—

I. (1) Name, Age, Sex, Caste etc., (2) Tháná whence brought. (3) Date of death. (4) Date of P. M. Examination. (5) Name of Police officer identifying the body.

II. (1) Condition of nourishment. (2) Rigor Mortis. (3) Pupils (4) Hypostasis (5) Degree of decomposition.

III. Condition of orifices, wounds, bruises, ligature marks, etc.

IV. Fractures and Dislocations.

V. (a) Scalp (b) Skull (c) Membranes (d) Brain (e) Spinal Cord.

VI. (A) Lungs—(1) Chest walls (2) Pleura (3) Left lung (4) Right lung.

(B) (1) Larynx (2) Trachea and Bronchi (3) Thymus and Thyroid.

(C) Heart :—(1) Pericardium (2) Right cavities (3) Left cavities (4) Valves. (D) Great vessels.

(E) State of Blood. (F) Pharynx and Oesophagus.

VII. (1) Peritoneum (2) Stomach (3) Contents of stomach. (4) Small Intestines and contents (5) Large Intestines and contents (6) Liver (7) Spleen (8) Kidneys (9) Bladder, Prostate etc. (10) Ovaries and Fallopian Tube. (11) Uterus and Vagina (12) External Genitals.

VIII. Details of special examination of disease, injury etc.

IX. Material reserved for chemical analysis and property made over to Police (stomach, its contents, portions of lungs, liver, spleen, kidneys ; urine separately bottled).

X. Opinion as to cause of death.

(O) Form for forwarding to Chemical Examiner.

Besides a covering letter, the police surgeon in India has to fill up a form which has the following headings, under each of which information is sought (See p. 46):—(1) Police Station from which the body was received. (2) A short history of the case from Police Report. (3) List of Viscera sent to Chemical Examiner. (4) Short notes as to any appearances suspicious of poisoning (5) How packed [Impression of seal to be placed at foot of this column.] (6) Copy of the label on the bottle. (7) Name of the medical officer holding the p. m. examination. (8) Date and hour of despatch by the medical officer. (9) Opinion of the medical officer as to the cause of death. (10) Name of Police officer to whom made over.

(P) Law—Indian and English.**General Clauses.***English.*

Child below 7 years—is in-
offensive.

Understanding matures bet-
ween 7 & 14 years of age.

Marriageable age for girls
—is over 12 ; for males, over 14.

Majority attained—21st year.

Indian.

Child below 7 years—inoffensive.

Understanding matures between
7—12 years. I. P. C. § 83.

Consent for sexual intercourse
(Act x, 1891) ; for harm I. P. C.
§ 90 ; other cases I. P. C. § 87 ;
not necessary—I. P. C. §§ 89-92.

Marriageable age (girls) 12
years. None fixed for males.

Majority attained in 18th year ;
under Act 9 of 1875 § 3, in the
21st year.

Whipping, Cr. P. C. § 393, 394.

Burn.

24 & 25 Vict. c. 100 § 29
Children's Act 1908, § 15

I. P. C. §§ 323, 324, 326.
Grievous hurt § 320 I. P. C.

No property can vest in a dead body. To burn a dead body surreptitiously is no offence in law, save that it may (a) violate the law of registering deaths and (b) create nuisance by the fumes arising.

Starvation.

Children's Act 1908, Part II
§ 12. Art. 1 & 2, Report of Lord
Hale's Homicide Committee.

I. P. C. §§ 304 A., 302

Wounds and Injuries.

24 & 25 Vict. c. 100
§§ 18, 20, 11.

Gunshot wounds—24 & 25
Vict., c. 100, §§ 14, 18, 19, 28

Finding of projectile not
necessary.

Vitriol throwing—24 & 25
Vict. c. 100 § 29

Assault and Battery § 352 ;
Hurt, §§ 323, 337 ; Grievous
Hurt, §§ 324, 338 ; Attempt
to commit murder § 307 ;
Culpable homicide §§ 308, 298,
300 ; Kind of weapon §§ 324,
326 ; Aiding and abetting,
§§ 305, 306 ; Attempts to com-
mit murder or suicide §§ 308,
309. [All refer to I. P. C.]

Survivorship.

I. E. A. §§ 107, 108.

Infanticide.

Complete and live birth to be
proved, 1. Vict. c. 85, § 2.

Law assumes, every child is
born dead. Live birth is
not always=viable birth.

Death (even from immatur-
ity) after attempt at abortion
is indictable.

I. P. C. § 315. Partial birth
sufficient for homicide § 299,
(Expl. 3) Preventing live birth,
I. P. C. § 315. Act 8 of 1870.

Illegal omission I. P. C.
§ 32 Abandonment I. P. C.
§ 317.

Poisoning

Not defined, but see I. P. C. §§ 284, 299, 324, 326, 328. 'Charm' is not a poison (R *vs.* Ghorai 1 Suth, Cr., 7.)

Rape.

24 and 25 Vict. c. 100
§§ 48, 63. (Punishment)
9 Carrington & Payne R.
vs. Gammon (vulval penetrn)
1 Hale, p. 631. Boy under
14 legally impotent.

Age of Consent—over 13
& up to 16. 48 and 49 Vict.
c. 69 (unsoundness of mind
or intoxication does not pre-
vent consent.) Intoxicating
for rape, 48 & 49 Vict. Proceed-
ing to be within 3 mo. Per-
sonating husband culpable.

Age of Consent—Act X of
1891 § 1. Also I. P. C. § 361, 373
Vulval Penetration sufficient
I. P. C. § 375. expl. Bo H. C., Feb.
1879.

Child under 7 is impotent
(I. P. C. § 82). Child between 7
and 12 is responsible, if mature
(§ 83). Consent invalid when
mind unsound or intoxicated—
I. P. C. §§ 90, 375.

Female compelling boy to
have intercourse is not rape.

Abortion.

24 and 25 Vict. c. 100, §§
58, 59, as amended by 27 and
28 Vict. c. 47. No recognition
of justifiable abortion. *Con-*
sent of woman and nature of
substance expelled are im-
material. [In case of her
death, law of *homicide* ap-
plies.]

Justifiable when I. P. C. § 312
Causing miscarriage, I. P. C. §§
312, 313, 314, (consent) 316, 315

Attempt to cause miscarriage
I. P. C. §§ 511 or 328. Viability
of child aggravates offence.

Nature of expelled substance
material.

Unnatural sexual offences.

24 and 25 Vict. c. 100,
§ 61, 62. Oral coitus not
buggery. •

I. P. C. § 377.

Insanity.

Military : 41 & 45 Vict.
 c. 58.
 53 Vict. c. 5 ; 54 & 55
 Vict. c. 65 ; 49 & 50 Vict.
 c. 25 ; 24 & 25 Vict. c. 100.
 104 ; 1 & 2 Geo 5, c. 18.

Military : Acts 11 of 1877,
 13 of 1894, 5 of 1909.
 I. P. C. § 84, 90. I. E. A. § 118.
 Cr. P. C. §§ 466, 471 Act 4 of 1912.
 Acts 34 & 35 & 36 of 1858.
 Prisoners' Act 1900 § 30
 Act 18 of 1886, 20 of 1889.

P.—Naked-eye Identification of Poisons.**Crystalline or Scaly solid substances :****COLOURLESS AND ODORLESS :**

Shining scales (a) with pungent taste = *Acetanilide* ; (b) without taste = *Phenacetin* ; (c) trimetric, tabular and bitter = *Salicin* ;
 (d) with odour = *Naphthol*.

Non-shining scales that are bitter = *Phenazonum*.

Crystals (a) exhibiting triangular facets = *Antim. Tart.*
 (b) Pungent, saline, cubic crystals = *Pot. Bromide*.

Prisms—(a) tabular, right rhombic prisms = *Argenti Nitras* ;
 (b) Acid and heavy = *Hydrarg. Perchlor* ; (c) Bitter = *Picrotoxinum*
 (d) Striated, with cooling saline taste = *Pot. Nitras*.

Silky (a) needles = *Caffeine* ; (b) crystals = *Cocaine hydrochlor* ;
 (c) nearly colourless = *Atropine*.

COLOURLESS BUT PUNGENT SMELLING = *Chloral Hydras*.

NEARLY COLOURLESS octahedra = *Codeine*.

OPAQUE crystals, iodine-odoured = *Pot. Iod*.

WHITE (i) crystals—(a) aromatic, tasteless = *Salol* (b) filiform, silky, bitter = *Quinine*.

(ii) Scales—(a) pungent-smelling = *Butyl chloral Hydras*
 (b) Odourless, sweetish-saline = *Sodii Salicylas*.

YELLOWISH, (a) sweetish-acid, odourless = *Acid Salicylic* (b) Becoming red, on exposure = *Physostigmine*.

(c) Inodorous, acicular = *Aloin*.

(d) Odorous, lustrous scales = *Iodoform*.

RED—DISH, (a) hygroscopic, odourless = *Acid Carbohc.*

(b) Odourless, deliquescent needles—*Acid Chromic.*

ORANGE : (a) Small crystals = *Arsenii Iodidum* ; (b) large, transparent triangular crystals = *Pot. Bichromas.*

GREYISH BLACK = *Antim. Nigrum. Purif.* GREYISH WHITE—shining needles (green on exposing) = *Apomorphine.*

DEEP VIOLET, slender, odourless = *Pot. Permanganate.*

Prismatic Solid substances :

COLOURLESS : (1) Hexagonal = *Aconitine* ; (2) Flat rhombic, feebly bitter (yellow on exposing) = *Santonine* (3) Trimetric prism, bitter = *Strychnine* and its *hydrochloride* : (4) Monoclinic, shining, bitter = *Cocaine.*

WHITE : (a) Acicular, with silky lustre = *Morphine Hydrochlor* ; (b) monoclinic, with vinous smell = *Plumbi Acetas.*

BLUE = *Cupri Sulph.*

BLACKISH VIOLET = *Iodine,*

Powdered Solid Substance :

WHITE, HEAVY, ODOURLESS & TASTELESS : (1) In stratified masses ; when finely powdered, floats (?) on top of liquid—*Acid Arseniosus* (2) Does not blacken when rubbed with sweat = *Bismuth Subnitrate* (3) Does blacken when rubbed with sweat = *Calomel* (4) *Plumbi Carb.* WITH ACRID TASTE—*Hydrag. Perchlor.*

WHITE, NOT HEAVY : (1) *Hydrag. Ammoniat, Pilocarpine nitras* (2) Deliquescent, bitter, acrid = *Hyoscyaminae Sulph.* (3) Very soluble, bitter = *Morphinac Acetas.*

WHITE, SALINE : (1) Nauseous, bitter = *Pot. Iod.* (2) Pungent, Saline = *Pot. Bromide* (3) Bitter and cooling = *Mag. Sulph* (4) Very acid = *Oxalic acid* (5) Caustic, deliquescent, opaque = *Zinci Chloride* (6) Transparent, strong metallic styptic taste = *Zinci Sulph.*

GREYISH (a) white = *Antim. oxidum, Hydrag. c. Creta, Veratrine* (b) Black = *Antim Nigrum Purif.*

RED (a) dull red = *Antim. Sulphuratum* ; (b) orange-red = *Hydrag. oxid. rubrum* ; (a) Vermilion-red = *Hyd. Iod. Rubr.*

YELLOW : (a) Tasteless, inodorous, crystalline = *Chrysarobini* (b) *Hydrag. Oxid Flav.* (c) Heavy = *Plumbi Iodidum.*

Liquid Substances.

COLOURLESS (1) with characteristic smell : *Acid Acetic Glacial*, *A. Carbolic*, *A. Hydrocyanic*, *Alcohol*, *Benzol*, *Carbon disulphide*, *Chloroform*, *Creasote*, *Ether*, *Liquor Ammoniae fort.* (2) Fumes = *Nitric acid* (3) Oily consistency and evolves heat on mixing with water = *Sulphuric Acid* (4) Alkaline and soapy feel = *Ligr. Potassae* (5) Astringent, sweetish taste = *Ligr. Zinci Chloride*, *Ligr Plumbi Subacetes*—which becomes white on exposure (b) Strongly acid = *Ligr. Hydrarg. Nitratis Acid.*

YELLOWISH : (a) With aromatic odour = *Amyl Nitris*. (b) with metallic taste = *Ligr. Ars. et Hydrarg. Iod.* (c) Nearly inodorous, bland nutty taste = *Ol. Amygdalae* (d) Brownish, viscid with disagreeable odour and acid taste = *Ol. Crotonis*.

Radices.

ACONITE : *Length* 2" to 4", *diameter*—at upper end, $\frac{1}{2}$ to $\frac{3}{4}$ " and at tapering tip, crowned with remains of undeveloped bud. It is neither hollow, nor spongy, being *externally*, dark brown and *internally*, whitish and starchy. It should not retain any portion of stem. No marked *odour* ; *taste* : at first slight, followed by persistent tingling and numbness in the mouth.

BELLADONNA : *Length* : 6" to 12" ; *diameter* : $\frac{3}{8}$ to $\frac{1}{4}$ inch, it is nearly cylindrical or longitudinally split. *Externally* : pale, greyish brown and finely wrinkled longitudinally. *Internally* : whitish and starchy.

GELSEMIUM : *Length* 6" or more, tortuous. *Diameter* : $\frac{1}{4}$ to $\frac{3}{4}$ ", nearly cylindrical. *Externally*, yellowish-brown, finely wrinkled. *Internally*, porous, yellow wood, rendered distinctly radiate by the presence of numerous, conspicuous, straight medullary rays. *Taste*—slightly bitter. *Odour*—slightly aromatic.

ARNICA (Rhizome) : *Length*—1" to 2". *Thickness* : $\frac{1}{6}$ to $\frac{1}{4}$ ", cylindrical, horizontal. *Externally* : Dark brown, bears amplexicaul leaf-scars, under-surface has numerous wiry roots. *Internally*, there are several resin-ducts near inner margin of cortex. *Taste* : acriid, bitter. *Odour* : faintly aromatic.

Folia.

BELLADONNA : *Stalks*, short. *Arrangement* : alternate below, but in unequal pairs above. *Description* : 3" to 8" long, broadly ovate, entire, glabrous. *On transverse section*, bi-collateral vascular bundles seen, mesophyll contains numerous cells, *corolla* : gamopetalous, campanulate, of dingy purple colour.

COCA : *Length*—1½ to 3", 1 to 1½" in *breadth*. *Description* : brownish green, oval, entire, glabrous, upper surface bearing a distinct ridge above midrib; on the under-surface, near to midrib and on either side of it, a curved line is almost always distinctly visible; the midrib itself is prolonged into a minute horny apiculus, which, however, is frequently broken off. *Odour* : faint, characteristic. *Taste* slightly bitter, followed by numbness.

CONIUM : *Length* : 2 feet. *Description* : They are more or less divided in a pinnate manner, the lower decompound, glabrous; their ultimate divisions terminate in smooth, colourless, horny points. *Odour* : Strong, disagreeable (mouse-like.)

DIGITALIS : *Length* : 4" to 12". *Breadth* : 5" to 6". Has winged *petiole* down which the lower veins are decurrent; broadly ovate or ovate-lanceolate, subacute, crenate or irregularly crenate-dentate. *Upper surface*—somewhat rugose, dull-green, slightly hairy. *Under surface*—paler and densely pubescent. *Odour*—nil. *Taste*—very bitter.

HYOSCYAMUS : *Length* : 10". *Sessile*. *Arrangement* : alternate. Exstipulate, triangular-ovate or ovate-oblong, acute, undulated, irregularly toothed, sinuate, pinnatifid, midrib conspicuous, pale green, furnished with glandular hairs, specially on undersurface. *Corolla*—is yellowish with a network of purplish veins. *Odour* : strong, characteristic. *Taste* : bitter, acrid.

STRAMONIUM : *Length* 4" to 6". Ovate, petiolate, unequal at base, sinuate-dentate, acuminate. *Upper surface*—dark, greyish-green, minutely wrinkled, *under surface* : paler. *Odour* : characteristic. *Taste* : bitter, unpleasant.

Fruits.

CONIUM : *Shape*—broadly ovoid. *Colour*—greenish grey. *Length* : $\frac{1}{8}$ ", *Breadth* $\frac{1}{8}$ ", laterally compressed, crowned by the depressed stylopod. *Mericarps*—glabrous, possess 5 irregular, crenate, primary ridges ; *endosperm*—deeply grooved on commissural surface. No marked *odour* or *taste*.

POPPY : *Shape* : round, depressed ovoid. *Diameter* : 2"—3" suddenly contracted below into a neck and crowned above by the stellately arranged stigmas. *Pericarp*—thin, dry, brittle, pale yellowish-brown externally and of bitter *taste* ; from inner surface of pericarp, a number of thin brittle placentas project into the cavity. *Seed*—numerous, small, reniform, reticulated, whitish. Fruits are *inodorous*.

Seeds.

AMYGDALA AMARA VEL DULCIS : *Length*— $1\frac{1}{2}$ ", nearly oblong, more or less compressed, rounded at one end, pointed at the other. *Testa*—cinnamon-brown, thin, rough. *Cotyledons*—two, plano-convex. *Taste*—bland, *Odour*—that of HCN.

COLCHICUM. *Diameter*— $\frac{1}{16}$ inch, Subglobular. Slightly pointed at hilum, dull reddish-brown, rough, tough, minutely pitted. *Endosperm*—oily. *Odour*—nil. *Taste*—bitter, acrid.

NUX VOMICA : *Diameter* : $\frac{3}{4}$ " to 1", and $\frac{1}{4}$ " thick. Nearly disc shaped, concavo-convex, nearly flat. Ash or greenish grey, surface is covered with short, satiny, radiately arranged and closely appressed hair. *Endosperm*—large and horny. *Cotyledons*—small and leafy. *Odour* (unbroken)—nil. *Taste*—bitter.

PHYSOSTIGMA : *Diameter* $1" \times \frac{3}{4}" \times \frac{1}{2}"$. Reddish or chocolate brown, oblong, reniform. A broad dark furrow extends nearly the entire length of the curved margin. *Testa*—hard, thick, rough. *Cotyledons*—firm, white, starchy. *Taste, smell*—nil.

STAPHISACRE : Irregularly triangular or obscurely quadrangular, arched, blackish brown when fresh but becoming dull greyish brown by keeping. *Testa*—wrinkled, pitted. *Interior*—soft, whitish, oily. *Taste*, bitter, acrid, nauseous. *Odour*—nil.

STRAMONIUM : Dark brown, $\frac{1}{8}$ " long, reniform, flattened. Surface pitted and reticulately depressed. *Embryo* is curved and embedded in white, oily, albumen. *Odour*—nil. *Taste*—bitter.

STROPHANTHUS : Oval, flattened, acuminate, of greenish fawn colour, covered with silky, appressed hair. *Length*— $\frac{3}{5}$ " *Breadth*— $\frac{1}{6}$ ". A longitudinal ridge runs from centre to apex of seed. *Odour*—characteristic. *Taste*—bitter.

(Q)—Form of Medical Certificate in Lunacy cases

Schedule I, Form 3. [§§ 18, 19 of Act IV of 1912.]

In the matter of [name of lunatic] of [address] in the town or subdivision of—, in the district of—, an alleged lunatic.

I, the undersigned [full name] do hereby certify as follows.

1. I am a [gazetted or qualified medical practitioner] and I am in the actual practice of the medical profession.

2. On the [date] day of [month] of 19—, at [place of examination] in the town of [name] in the subdivision of [name] in the district of [name], [separately from any other practitioner], I personally examined the said [name of lunatic] and came to the conclusion that the same [name of lunatic] is a lunatic and a proper person to be taken charge of and detained under care and treatment.

3. I formed this conclusion on the following grounds viz.,—

(a) Facts indicating insanity observed by myself, viz.,—

(b) Other facts (if any) indicating insanity communicated to me by others, viz.,—[State the information and from whom]

[Name]

[Designation]

[1. A medical certificate to be valid must (a) be given in the above form ; (b) state facts observed and facts communicated ; (c) be given not more than clear 7 days before the date of petition for detention ; and (d) be given by men with registrable qualifications, and where 2 are given, each is to be separate [§ 19 (2)]

2. A medical certificate is tantamount to a deposition on oath [§ 18 (3)] ; it can be altered, ammended or, added to, at any subsequent stage (§27).

3. Medical men may secure access to lunatics [§§ 41 (2), 42] and acts done by them bonafide are immune from law suits [§ 97]

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OUTLINES OF MEDICAL JURISPRUDENCE.

APPRECIATIONS.

By Surgeons-General with the Governments of :—

Bengal :—I have read with much interest your book, Medical Jurisprudence etc., and have spoken about it and *recommended it at the Medical College and Campbell Medical School*. (No. 1499—D. 6-9-1910).

Bombay :—In his opinion, the book will be useful to Sub-Assistant Surgeons in their Dispensary or Hospital Laboratory. (No. B. 17057. 12-12-10)

Madras :—The Surgeon-General has perused the book and considers it an *excellent* book for the purpose for which it is intended (No. 66-1367. 15-3-1911).

By Inspectors-General of Govt. Civil Hospitals in :—

Assam :—*I think very highly of it.* It should prove *very useful* to medical students and practitioners. I am forwarding your letter and the printed notice to the Superintendents of Dacca Medical School and the Berry-White Medical School at Dibrugarh.

Punjab :—The book has been placed in the Punjab Medical Library for reference. (No. 7729—H. 10-12-10).

Central Provinces :—Dr. Ray is informed that his book has been *circulated to the Civil Surgeons* in these Provinces for information and private purchase (No. 200—15-12-10).

Behar & Orissa :—I like it very much. It will be *most useful* to practitioners and students and I intend to *recommend it to the medical services* in this province and to the Superintendents of the Medical Schools. Your book will be placed in the medical library. (Vide Circular letters No. 2001 to 2023, dated 2-4-1913)

By other Medical Men of Eminence :—

Col. K. MCLEOD, M.A., M.D., LL.D., F.R.C.S., I.M.S., author of **Medico-Legal Experiences in Bengal**.—It is a *very valuable* book for purposes of instruction and reference. It is *admirably arranged, very accurate*, and ought to be *most helpful* to students and practitioners. In the present form, it is really *unique and excellent*.

Calcutta : Principal, Medical College :—I have read your excellent book with pleasure and profit, formed a high opinion of its excellence, and *brought it to the notice of the civil and military students of the College* (6. 3. 1913).

Calcutta : Superintendent, Campbell Medical School :—I have read it with much interest and instruction. It is *clearly arranged* and gives the essentials of the subject *tersely and lucidly*. I think it should prove of *real assistance to students and practitioners* and I will do what I can to recommend it to the students of the Campbell Medical School. (14. 7. 1911).

Burma : Superintendent, Government Medical School :—The book is a good one and *will be recommended for use in this school*. (30. 4. 1913)

Tippera : Edward Memorial Medical School :—It is an excellent book, adopted all over here.

Agency Surgeon, Eastern Rajputana States—has by a Government order, adopted the book for guidance and reference by *all medical officers throughout the State*. (31. 1. 1911).

Agra : Principal, Medical School :—I think it would be a useful book. (No. 1061, 14. 9. 10).

Dibrugarh : Supdt., Berry-White Medical School :—I am enjoying reading it and look upon it as the big volumes of Taylor boiled down. I shall certainly recommend it for use here.

District and Sanitary Boards, Sarun District and of several districts of Madras Presidency—have of their own accord subscribed several copies.

By Professors in Government Colleges :

Lahore :—It contains *a mine of information* in a very short compass and will be of much service to medical students. (14. 9. 10)

Madras :—I consider your book *a very useful one* and it ought to be a great help to students. The chapter on toxicology and treatment of poisoning is *specially well written and I congratulate you on your labours*. (20. 10. 10.)

Calcutta :—I have read over *very carefully* your little book. I consider it ought to make *an excellent handbook for practitioners*. From the students' point of view, it should afford a *splendid* schema or plan to guide them to get up their work systematically and well. As regards subject-matter, your book is *very nicely compiled indeed*.

Lucknow :—To assist students in their preparation for examinations, *no better book exists*. The chapter on Toxicology is admirably and splendidly got together. *It supplies a great want*. (19. 3 1915).

Professor of Mental Diseases, Calcutta Medical College :—The chapter on Insanity is an admirable summary. It does not contain any inaccuracies. *It is adapted to the requirements of busy students of medicine*. The rest of the work appear to me to be upto the same standard of excellence. (3. 12. 1912).

By Teachers in Government Schools in :—

Calcutta : Campbell Medical School :—It is an excellent summary of medico-legal facts. The chapter on poisons is very lucid.

Calcutta Medical School :—It is so *concise* yet so *graphic*, so *cheap* yet so *valuable*. (2. 9. 10).

Cuttack :—I have formed a *very high opinion* of your work, which is a very valuable precis of the subject. I have recommended it to my students. (25. 9. 10.).

Bankipur :—The arrangement of subject-matter is *excellent, concise and systematic*. It is *an indispensable booklet* for every student of forensic medicine, and it *fully deserves success*. (10-9-10)

Ahmedabad :—It will serve *admirably* the requirements of medical students. (26-9-10).

Hyderabad (Sind) :—It is a *useful book* and I shall be happy to *recommend it* to my pupils.

Poona :—Your book is indeed very *concise and interesting*. I think your book *supplies a great want*. Lt-Col. Smith, I.M.S., our Superintendent, who has seen your book, has promised to write about it, recommending its adoption as a text book here. (21-10-10).

Royapuram (Madras) :—It is a very handy and useful book for students and pupils, specially the portion on toxicology. I wish the book every success. (19-1-10).

LAWYERS' APPRECIATIONS.

Sir S. P. SINHA M.A., Bar-at-law, Formerly, **Law Member, Executive Council of India**; Advocate, High Court, Calcutta :—Dr. Ray's book will prove useful to lawyers practising in the Criminal Courts as also to students of legal medicine.

Sir C. ARNOLD WHITE, Kt., **Chief Justice, Madras High Court** :—I have no doubt it will prove useful to practitioners.

Sir G. D. BANERJI, M.A., D.L., PH. D., KT., Formerly one of His Majesty's Judges of the **Calcutta High Court**; Vice-Chancellor, **Calcutta University**; President, Text-book Committee, &c.;—Your book evinces admirable skill in the lucid condensation of a mass of useful matter within a small compass. It will be of much service to legal practitioners.

Sir A. H. S. REID KT., **Chief Judge, Punjab** :—It will be very useful to the Bench and the Bar and the index and the arrangement of the subject facilitate reference very satisfactorily.

Sir S. ISMAY C.S.I. Bar-at-Law, **Chief Judge, Mysore** : Your multum in parvo on Jurisprudence will, I hope, find a ready sale.

THOMAS THORNHILL Esq., Bar-at-Law, L.L.D., **Chief Judge, Small Causes Court, Calcutta** :—I have perused the book and have been struck with the quantity of valuable information so concisely contained in it. It should prove invaluable.

D. SWINHOE Esq., Bar-at-law, **Chief Presy. Magistrate, Calcutta** : The subject matter has been carefully and systematically arranged and dealt with. It will, I am sure, prove very useful and instructive to those who practise in criminal courts.

Mr. H MITRA, M.A., B.L., **Public Prosecutor, Alipur**, This excellent treatise will be of great practical use to all persons entrusted with the investigation or conduct of criminal cases. The medico-legal points have been grouped under different heads in a way which renders the book very easy of reference.

Mr. M. MITRA, M.A., B.L., **Public Prosecutor, Hughli** :—This excellent book will, I am sure, be of great use to the pleaders who practise in criminal courts, and I have pleasure in recommending it to them. (22-9-10).

POLICE DEPARTMENTAL ORDERS.

Calcutta Police Daily Notification, May 2, 1913. Bengal Police Gazette, 30th Sept., 1910. E. B. and Assam Police Gazette, 10th Nov. 1910. Bihar & Orissa Police Gazette, 8th Novr. 1912. United Provinces Police Gazette, 23rd Decr. 1910.	} Contain the follow- ing Noti- fication :—
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"The Inspector-General wishes to recommend to all police officers a book entitled "Medical Jurisprudence &c." by R. C. Ray, Published by the Hare Pharmacy....."

This book is one of the few books specially recommended in the Government publication, "Guide to Medical Jurisprudence".

PRESS OPINIONS.

LEGAL :

Calcutta Weekly Notes :—The portion dealing with poisons, which constitute the major portions of the work, will prove *equally useful to medical and legal practitioners*. The object with which this book was written has been *amply* fulfilled.

Calcutta Law Journal :—The book is *specially useful to members of the legal profession*.

Allahabad Law Journal :—The *talented author* has focussed the cream of medico-legal knowledge in this *handy and convenient* work which contains a mass of useful information carefully summarised and *helpfully* tabulated. The section dealing with poisons is *specially to be commended* and we hope *no practitioner in the criminal courts will go without a copy* of Dr. Ray's admirable 'Outlines'.

Madras Law Journal :—We welcome these 'Outlines' as *eminently useful* for students of Law and Medicine. The book will also serve as an *excellent* analysis of the science of medical jurisprudence for lawyers practising in the criminal courts. The analysis of matter *leaves nothing to be desired*.

Bombay Law Reporter :—It is likely to be useful to the legal profession.

Bombay Lawyer :—It is *bound* to be serviceable as a *compact* and *correct* work, representing the *most upto date* knowledge.

MEDICAL :—

British Medical Journal (13th May 1911 & 7-12-12) :—It is a *compact, admirably arranged, well-balanced, wonderfully exhaustive* synopsis of *all* the knowledge which a medical jurist ought to possess or is likely to require in practice. The work *displays extensive and well-digested reading, great power of logical tabulation and concise description* and is distinguished by *lucidity and accuracy*. The section relating to poisons is *particularly good* and calculated to be *readily available for emergencies*. For use as a text-book or for preparing for examinations, *no better* treatise can be placed in the hands of teachers or students. It possesses *cosmopolitan* value.

Lancet (8th July 1911 & 29. 3. 1913) :—The author shows *considerable ability* and a *thorough knowledge* of the subject. This book is much appreciated. The subject matter has been *admirably arranged* and the chapters cover a good deal of ground. We believe that the book will be found of *great value* by those for whom it is intended. We can cordially recommend it to readers *in this country* (England) *also*. It is full of good practical instruction.

Therapeutic Gazette :—We have no doubt that it will prove useful in India ; and to those who are interested in this topic, it will be of interest as indicating the difference between the medico-legal matters in the Far East and in this country (America).

Australasian Medical Gazette (11. 1. 1913).—The chapters on Toxicology and Insanity have been treated in a very practical manner.....A compact, upto date and correct work, which every student and practitioner will find of great use.

Indian Medical Gazette (1910, & March 1913) :—Dr. Ray has compiled the *most compressed book* on medical jurisprudence and toxicology that we have ever read. He has managed to compress a *vast amount of information* on these subjects. The chapters on Insanity, Sexual Matters, Criminal Abortion &c. are very well done and complete. *We have not found any mistakes ; we think that Dr. Ray has been entirely successful, and we can commend his book.*

